Quotas and Cooperation

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Abstract: Selection by quotas is an important policy measure in the affirmative action tool box. Despite quotas being effective for achieving certain numerical representations, they can come with unwanted side effects, for example in the form of uncooperative behavior in the group created by the quota. In the laboratory, we investigate the extent to which preferential selection in the form of an unrepresentative quota impacts group cooperation and examine the underlying mechanisms. In the experiment we create two groups by randomly assigning subjects colors. In the unrepresentative quota treatment, subjects of one color are selected into a privileged group by performance in an unrelated task whereas subjects of the other color are selected solely based on the quota. We compare contributions in a public good game in this treatment to behavior in a control treatment, where the two colors are treated symmetrically and all members of the privileged group are selected by performance. Our results show significantly less cooperation in the former treatment and we furthermore find that all players in the group are similarly affected. This effect is persistent even when subjects are given a rationale for the unrepresentative performance quota, e.g., by appealing to efficiency or fairness arguments. The negative effect on cooperation from the unrepresentative quota disappears when selection is made completely randomly instead of by performance.

Key words: discrimination, gender gap, experiment, quota, cooperation, public goods

JEL codes: C91, C92, D03, J15, J16, H41

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1. Introduction

Selection by quotas is a commonly used policy tool for getting closer to a desired representation between genders, races or ethnicities. In political representation, the use of quotas is widespread; Krook (2009) shows that close to 100 countries in the world employ, or have previously employed, quotas for women in politics. The interest for the use of quotas is now spreading beyond the political sphere and is reaching also the corporate world (see e.g. Ahern and Dittmar, 2012). Even though quotas are often effective in the sense of reaching a specific numerical representation, there can be unwanted negative side effects (Pande and Ford, 2011). The focus of this paper is on one particular such effect, namely that of cooperation problems in groups created by quotas.

In 2003, Norway, as one of the first countries in the world, unexpectedly announced that Norwegian public limited- and state own companies would be required to have at least 40 percent representation of each gender on their boards by 2008 to avoid forced liquidation. This provided a unique opportunity to research the causal effects of quotas. The policy has been shown to affect the management practices of boards and has adversely influenced short-run profits (Matsa and Miller, 2011 and Ahern and Dittmar, 2012). It has been hypothesized that one change in management practice is related to cooperation problems, which some boards experienced as a consequence of the quota (Stenseng, 2010; and Dagens Naeringsliv, 2010; see also Clarke, 2010). ¹

Seemingly inefficient and uncooperative behavior following quotas or other affirmative action procedures can also be found in other contexts, for example in education. In the United States, quotas for minority students have been used at all levels of schooling in an attempt to increase diversification of the student body. Sometimes the consequences have

¹ Huse and his coauthors have written extensively about the experience of women on corporate boards in Norway. Especially the discussion about how board members who enter the board by different procedures, for example women or employee representatives, can have a lower esteem than other board members is relevant for this paper. See e.g. Huse and Solberg (2006), Huse et al. (2009), and Nielsen and Huse (2010). See also Terjesen et al. (2009).
been dramatic, as was for example the case during the Boston riots in the 1970s following quotas for, and busing of, minority children to previously primarily white schools (Lukas, 1986). At college and graduate school level, quotas have been documented to lead to uncooperative behavior, for example in the form of reluctance to share information, both within the student population and between students and teachers (Dreyfuss, 1979; Crosby and VanDeVeer, 2000).

There are also examples of how affirmative action in the workplace can lead to cooperation problems. One area where this has been found is among firefighters. In the United States affirmative action and quotas have been used since the late 1960s in order to increase the number of female and minority firefighters. This has often been claimed to lead to a decrease in cohesion and cooperation between colleagues, both in training and on the job (Dreyfuss, 1979 and Chetkovich, 1997).

The above examples suggest that quotas can give rise to cooperation deficits, but there has been little systematic research on this topic. The aim of this paper is to investigate whether preferential selection in the form of an unrepresentative quota has a negative impact on group cooperation and, if so, to examine the underlying mechanisms.

The experimental method has some limitations that it is important to be aware of. Some factors from the “real world” settings discussed above, such as interaction over longer time periods, will not be captured in the lab. However, laboratory experiments also have clear advantages when it comes to answering the questions asked in this paper. Most importantly, the controlled environment in the lab allows us to abstract away from preformed groups, such as gender or race, and focus entirely on the process of how a group is formed.

In the experiment described in this paper we create groups by randomly allocating the 16 subjects in each session a color: either orange or purple. Subjects do a math task and in the main two treatments the performance in the math task serves as selection device into a privileged group. This privileged group has eight members and is constrained to have
equal representation of purple and orange subjects. By varying the color composition of
the initial group of 16 subjects we create a control treatment where the two colors are
treated symmetrically and all subjects are chosen by performance in the math task and an
unrepresentative quota treatment where the purple members are selected into the privi-
leged group solely on the basis of the quota, with the orange players still being selected
by performance. With this design we capture two aspects of how unrepresentative quotas
are often perceived: first, that one group is treated preferentially in selection over the
other and second, that less weight is given to merit when selecting candidates from this
group.

In order to study cooperative behavior, we let the eight subjects in the privileged group
play a two-person public good game. This is designed so that all members take part in
seven games: one against each other member of the privileged group. Furthermore, the
subjects know the color of the person they are playing in each game. We find that
cooperation is significantly lower when the privileged group is formed by the
unrepresentative quota. In that case, subjects contribute about 30 percent of their
endowment to the public good, compared to a contribution rate of over 50 percent in the
control treatment. Henceforth we call this decline in cooperation the quota effect.

In addition to establishing this result, our design allows us to draw some inferences about
the mechanism underlying the quota effect. This is made possible by the fact that the
different theories offering explanations for the quota effect have different predictions
about whether, and how, subjects should differentiate their behavior depending on the
color-match in a particular game. We find that the quota effect is general in the sense that
it occurs regardless of the color of the player and the matched subject, a finding which
contradicts some theories, for example about the quota effect having its roots in a desire
by those who are disadvantaged by the quota to punish those who advantaged, but
supporting others.

Our experimental design also addresses a key policy aspect of quotas, namely the ques-
tion of justification. Following on work in social psychology, which has shown that the
acceptance of affirmative action policies can be impacted by whether, and how, the policy is justified (see e.g. Murrell et al., 1994 and Heilman et al., 1996), we introduce two different justifications for the unrepresentative quota, the first emphasizing efficiency gains and the second emphasizing fairness. However, even though subjects report that they find especially our fairness argument convincing, they do not become more cooperative when this justification is given compared to when there is no reason provided for the quota.

The unrepresentative quota in our experimental design captures two aspects of how affirmative action policies are often perceived. First, that it is a selection process which gives preference to one group over another and hence is unfair. Second, that merit plays less of a role in selection for candidates from the group which is given preference. In order to further understand the role of these two different aspects in causing the decrease in cooperation in the quota treatment, we also conduct two treatments that were identical to the two main treatments described above with the only difference that selection by performance was replaced with random selection. Hence, in this version of the quota treatment, preference was still given to one group, but the role of merit was the same for both groups. We find that this version of the unrepresentative quota has no negative impact on cooperation.

The research presented in this paper is related both to the work on procedural fairness in economics and procedural justice in psychology. The latter originally aimed at understanding the impact of individuals earning their roles in an experiment. (Hoffman and Spitzer, 1985; Cherry, 2001; and Oxoby and Spraggon, 2008). The most well known result in this strand of literature is due to Hoffman et al. (1994, 1996), who show that when the role as first mover in a dictator- or ultimatum game is earned, for example by answering a quiz, offers to receivers are significantly lower than when the role is allocated randomly. In psychology, it has instead been emphasized how a procedure which is perceived as just may provide social motivation and thereby influence
cooperative behavior (Tyler and Lind, 1992; De Cremer and Sedikides, 2005; and Tyler and De Cremer, 2006; see also Thibaut and Walker, 1975).

Our paper is closely related to the research of Balafoutas and Sutter (2010), who aim at combining procedures of affirmative action and quotas with the notion of procedural fairness. Their starting point is the work of Niederle et al. (2009), who show that a quota which guarantees women equal representation among the winners of a competition makes them as likely to enter a competitive setting as equally qualified men (in the absence of the quota women under-select into the competition, see also Gneezy et al., 2003; and Niederle and Vesterlund, 2007).

Balafoutas and Sutter (2010) conduct an experimental investigation of the effects of this quota on things other than willingness to compete. They follow the design of Niederle et al. (2009) and add a post-competition teamwork task and a coordination game. They find no effects from the quota on performance in neither the teamwork nor the coordination task. Importantly however, the team task and the coordination game that they use do not incorporate conflicting motives between the group and the individual, i.e. their games are not social dilemmas. Our research, on the other hand, uses a public good game in the post-affirmative action environment.

The rest of the paper is organized as follows. Section 2 describes the experimental design and provides a conceptual framework. Thereafter, in Section 3, we outline and discuss the results from the experiment. In Section 4, we discuss different theories providing explanations to why we see less cooperation when the group is created by the unrepresentative quota, and relate the theories to our experimental results. Section 5 concludes.

2. Experimental Design

The experiment was designed to have 16 subjects in each session. After having been seated in the laboratory, subjects were told that the study would have several parts where
they could earn money. It was also made clear that all the money earned would be paid to them in private at the end of the experiment and that the exchange rate between points in the experiment and dollars was such that 10 points corresponded to 3 dollars.\(^2\)

In the first part of the study, the 16 people in each session were randomly allocated a color: either orange or purple.\(^3\) These colors were chosen as they are politically neutral for American subjects. The subjects were told their color allocation on the computer screen and were also given a silicon bracelet with their color to wear for the duration of the experiment. Thereafter they spent two minutes filling out a paper form with five associations to their color. This was done in order to give the subjects some time to internalize their randomly allocated color.

In the second part of the experiment, subjects were told that they would be given a number of math tasks where each task would consist of adding up five two digit numbers\(^4\) and that they would be paid 1 point (i.e. 30 cents) for each correct answer. They had five minutes available to do as many tasks as possible with the maximum available tasks being 15. It was made clear that the number of task that they answered correctly would not be revealed until the end of the experiment.\(^5\)

After having solved math tasks for five minutes, part three of the experiment followed. Subjects were told that out of the 16 people in the session, eight would be selected into a privileged group called the “high stake group”. The other eight subjects would remain in the study as members of the “regular stake group”. In the instructions it was made clear that the members of the two groups would do the same thing in the rest of the experiment.

\(^2\) All experimental instructions can be found in Appendix A.

\(^3\) The fact that colors were allocated randomly ensured that the characteristics of the two groups were similar, e.g. with regards to gender, age and ethnicity. See Appendix D for details.

\(^4\) The purple subjects in treatment 1b added up three-digit numbers. This is described in detail below.

\(^5\) This task has been used previously be among others Niederle and Vesterlund (2007, 2010) and performance has generally been found not to differ between different groups such as between gender or ethnicities. We confirm that there are no differences in performance between people of different ethnicities, but we do find both a gender and an age differences. See Appendix B.
experiment, but that the high stake group members would have the chance to earn more money. This design and the relatively neutral naming of the two groups was chosen in order to make sure that it would be seen as desirable to the subjects to be selected to the high stake group without imposing a specific context on the situation.

It was also explained to the subjects that the high stake group would have four orange and four purple members (further details of the selection process will be discussed below). By varying the color composition of the underlying group of 16 subjects (a composition which was made clear to all subjects) this either meant that the two colors were treated symmetrically and there was no quota in expectation (the underlying group then consisted of eight purple and eight oranges players) or an unrepresentative quota favoring the purples (in these sessions the underlying group contained four purple and twelve orange players). Before the subjects were told whether they had been selected for the high stake group or not, they were given instructions for the game that was to be played in the next part.

The aim of part four of the experiment was to measure the degree of cooperativeness within the high stake group. We chose to do this with one of the classic social dilemmas, namely a two person public good game. In this game subjects were put in pairs and both were given an endowment of a certain number of points (20 points, i.e. USD 6 in the high stake group and 10 points, i.e. USD 3 in the regular stake group). The reason that we selected to have the subjects play a two-person public good game instead of a n-person public good game (with n>2) was that we wanted it to be clear to the subjects who they were playing each game with, in order to be able to assess whether subjects treated people of different colors differently.

The public good game was conducted in a standard way (following e.g. Fehr and Gächter, 2000, see also Ledyard, 1995 for a survey), and both subjects in the pair had to choose how much of the endowment to keep and how much to contribute to a project. What was contributed by the two subjects together was multiplied by 1.5 and then distributed equally between them. Everyone played the game with all the other seven
members of their group (either the high stake- or the regular stake group) and the
decisions were made simultaneously in the seven games. It was made clear to the
subjects that they would be paid according to the outcome of one randomly chosen game
out of the seven. The only thing the subjects knew about the person they played a
specific game with was that person’s color.

After the subjects had made their choices in all games, the experiment proceeded to a
questionnaire part where the subjects stated their gender, age and ethnicity. In addition,
the subjects were asked if they found the process by which the members of the high stake
group was chosen fair, and if they made a conscious difference when they played with
people of their own color and people with the other color.

2.1. Selection by performance: Treatments 1 and 2
As described above, the high stake group was put together as to consist of four purple
and four orange players. In the main treatments, treatments 1 and 2, the selection was
done so that the four players of each color who performed best in the math task in part 2
were admitted into the high stake group. In the unrepresentative quota treatment, which
was treatment 1, there were twelve orange and four purple players in the underlying
group of 16. This implies that when the four best of each color were selected, perfor-
mance did not matter for the purple players, since all of them were automatically se-
lected. This selection process was hence characterized by a quota that was giving
preference to the purple players, and made merit (which in this context meant
performance in the math task) matter only for the orange players.

We compare the behavior in the unrepresentative quota treatment to the behavior in
treatment 2, which is our control treatment. Here there was an equal representation of
purple and orange players in the underlying group of 16, i.e. there were eight orange and
eight purple players. Since colors were randomly distributed, this meant that the control
treatment had no quota in expectation, i.e. the two colors were treated symmetrical and
the eight players who performed best in the math task in part 2 were in expectation selected into the high stake group.\(^6\)

With the data from treatments 1 and 2 we can compare behavior in the public good game in a high stake group that consists of four players of each color and which differs only in how they were selected: either by a process characterized by an unrepresentative quota for the purple, or by a process where all eight high stake group members were selected by performance and symmetrically treated, regardless of color. This comparison will allow us to investigate whether cooperative behavior differs depending on the selection process. In addition, by examining if the players’ behavior depends on their own color and/or on the color of the person they are playing a particular game with, we will be able to draw some inferences about the mechanism at work.

2.1.1 Justification of the Unrepresentative Quota: Treatments 1b and 1c

In treatment 1 subjects were not provided any explanation for the preferential treatment that the purple players were given. Considering the contexts outside the laboratory where unrepresentative quotas are employed, this is unrealistic. When quotas are used it is most often for one of two reasons: A first argument that is commonly used for quotas is that they are there to enhance efficiency. An example is when those propagating for corporate board quotas for women claim that this will lead to more valuable perspectives being represented on the board, which in turn will improve the board’s decision making and the company’s performance (see e.g. Daily and Dalton, 2003; and Huse and Solberg, 2006). Second, it may be argued that the quota is correcting unfairness. Examples of this can be found in the affirmative action in the United States that gives preference to members of the Black minority with reference to this being a compensation for previous unfair

\(^6\) Note that selection may still not be entirely by performance. If, for example, there are five purple and three orange players among the eight best performers, only the four best of the purples will be selected and one orange player who is not among the eight best will be admitted into the high stake group. As a future extension of this work, it would be interesting to compare this situation with one where the eight best players are chosen, completely disregarding their colors.
treatments of members of this community (see e.g. Heilman et al., 1996 and Murrell et al. 1994 for a discussion of justifying quota with fairness arguments).

In order to be able to address this practical policy aspect of quotas, we designed two treatments that were versions of treatment 1, where justifications along the above lines were given for the unrepresentative quota.

Treatment 1b was identical to treatment 1 with the exception that an efficiency argument for the quota was given: When the difference between the high stake and the regular stake group was introduced in part 3, the instructions explained that the payoff rule was such that the members of the high stake group would only have a higher endowment than the members of the regular stake group if the high stake group had an equal proportion of purple and orange players. When the process by which the high stake group members would be selected was explained, the instructions pointed out that the reason that all the four purple players were selected was that thereby the requirement of equal proportions for the high stake group was fulfilled, hence giving all high stake group members the chance to earn more money than what would otherwise have been the case.

Treatment 1c was designed to capture the fairness argument, which was done by introducing a harder math task, where the numbers that should be added up had three digits instead of two. It was said explicitly in the instructions that there were two math tasks, one easy and one hard, and that the four purple players would do the hard math task. They would still be compensated with 1 point (i.e. 30 cents) for every correct answer. When it was explained how the selection into the high stake group would work, it was stated that the reason that all the four purple players were put in the high stake group, was that this was a compensation for the fact that they did a harder math task in part 2.

Treatments 1, 1b and 1c are identical in the sense that in all three cases, the four orange players, out of totally 12, with the best performance in the math task in part 2 were selected into the high stake group whereas the four subjects who were randomly selected to be purple were automatically admitted into the high stake group. The difference between
the three treatments is that whereas there was no rationale for the preferential treatment of purples in treatment 1, treatments 1b and 1c provided, respectively, an efficiency- and a fairness justification. These two versions of treatment 1 allow us to investigate whether the effect of the unrepresentative quota on purples on cooperation in the public good game is different when a rationalization for the quota is given and, in turn, if it matters how the quota is rationalized.

2.2 Random Selection: Treatments 3 and 4

As described in the introduction, the unrepresentative quota, as it is designed in this experiment, captures two different aspects of how quotas are often perceived. First, that the selection process is unfair in that it gives preferences to one group over another and second, that merit plays less, or no, role when candidates from the preferentially treated group are selected.

In order to differentiate between these two factors, we designed treatments 3 and 4, which are identical to treatments 1 and 2 respectively, with the only difference being that the selection into the high stake group was done randomly instead of by performance. By comparing the behavior in the public good game in the high stake group between treatments 3 and 4, we can learn whether any differences in cooperation that are found between treatments 1 and 2 also appear in a similar environment where selection is not done by performance.

Since treatments 3 and 4 by design use random selection and no references to performance in the math task is made, we can also use these treatments to investigate whether there is an inherent relation between how well a person does in the math task and how she behaves in the public good game. This is important in order to be able to exclude that any differences in behavior between treatments 1 (and 1b and 1c) and 2 come from an inherent association between math task performance and public good game behavior.
2.3 Implementation

The experiment was conducted at the Harvard Decision Science Laboratory and a total of 22 sessions were run. There were five sessions each of treatment 1 and 2, three sessions each of treatments 1b and 1c, and three sessions each of treatment 3 and 4. The sessions were conducted over the course of four days in late October and early November 2011 and five days in April 2012. All sessions had 16 subjects who were recruited through the SONA system at the Harvard Decision Science Laboratory. Out of the total of 352 subjects, who were only allowed to participate once, 55.4 percent were women. The median age was 23 years and the subjects earned on average 23 USD (including a USD 10 show-up fee) for participating in an experimental session which lasted about 45 minutes.

The subjects arrived at the lab a few minutes before the scheduled start and signed consent forms. When 16 people had arrived they were taken to the lab by the experimenter. They were all seated in one room, in 16 separate cubicles. The cubicles prevented them to see what any other subject was doing and also what color he or she was allocated. The experiment was programmed in z-tree (Fischbacher, 2007) and instructions were given both verbally, to ensure common knowledge, and on the computer screen. Key pieces of information were also given on paper so that the subjects

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7 Two additional sessions which were started had to be interrupted because of computer malfunctioning. Subjects in these two sessions were paid for their participation and were not allowed to participate again. No usable data were generated in these two sessions and they are hence not included here.

8 In October/November 2011, only treatments 1 and 2 were conducted. In April, treatments 1 and 2 were replicated and the other treatments were added. Apart from this, treatments were randomly allocated between sessions. The data on treatments 1 and 2 show no differences depending on whether data collection was done in October/November or in April. We therefore pool the data from these two occasions in our analysis. Further details are given in Appendix C.

9 An over recruitment was done in order to reduce the probability that sessions had to be cancelled due to too few participants showing up. The 16 who showed up first were allowed to participate in the session. Any extras above the 16 received only the show-up fee of USD 10 and could not participate.
could go back and review these parts of the instructions anytime they wanted. Subjects made all the decisions on the computer.

Instructions were given piece wise, before each part. On two occasions, before the math task in part 2 and before the public good game in part 4, subjects answered a quiz in order to ensure that everyone had understood the instructions correctly. The subjects had to answer all questions correctly for the computer program to continue to the next screen. Those who experienced difficulties answering any of the questions could request help by pressing a help button and they then received additional explanation in private by the experimenter. Thereafter they answered the questions in the quiz again.\(^{10}\)

2.4. Conceptual Framework and Hypotheses Generation

We model the two person public good game in a standard way. In each game two individuals, \(i\) and \(j\), are matched. Each individual \(i\) is endowed with \(y_i\) points and has to decide how many of these points to contribute to a project \((c_i)\) and how many to keep for herself \((y_i - c_i)\). The contributions made by \(i\) and \(j\) together are multiplied by an efficiency factor \(e\) and the resulting amount is shared equally between them. The total monetary payoff, \(\pi_i\), for individual \(i\) from the game is hence:

\[
\pi_i = y_i - c_i + \frac{e}{2}(c_i + c_j).
\]

Maximizing this expression with respect to \(c_i\) reveals that if \(\frac{e}{2} < 1\), the equilibrium for an individual who is motivated only by her own monetary payoff is to set \(c_i = 0\) (in our experimental design we have \(e=1.5\)).

However, we know from previous research that contributions in one shot public good games are most often substantially higher than zero. In a survey of public good game experiments, Ledyard (1995) conclude that contributions generally lie between 40 and 60 percent of the maximum. In order to understand this, a utility framework can be used,

\(^{10}\) Note was taken of the (very few) participants who experienced substantial difficulties in understanding the instructions. Excluding these observations does not make a difference to the analysis.
which allows individuals to care not only about their own monetary payoffs but also about the payoff of the matched player. We can then write the utility of player $i$ as

$$U_i = \pi_i + \alpha_i \pi_j,$$

where $\alpha$ measures the extent to which the payoff of individual $j$ matters for the utility of individual $i$. We follow Fehr and Schmidt (1999 and 2006) and assume that people put positive weight on the payoffs of those who are worse off than they themselves are, i.e. $\alpha$ is an indicator function such that $\alpha_i = 0$ if $\pi_i \leq \pi_j$ and $\alpha_i > 0$ if $\pi_i > \pi_j$. If both $y_i$ and $y_j$ are known, the only uncertainty that individual $i$ has about the monetary outcome of individual $j$ is hence related to $c_j$. We can therefore write $\alpha_i(c_i,E[c_j])$, where $E$ denotes expectations. Combining (1) and (2) yields the following expression for the utility function of individual $i$ has when she is making her decision about $c_i$:

$$U_i = y_i + \alpha_i(E[c_i,c_j])y_j + c_i \left( \left( 1 + \alpha_i(E[c_i,c_j]) \right) \frac{e}{2} - 1 \right) + E[c_j] \left( \frac{1}{2} - \alpha_i(E[c_i,c_j]) \right) - \alpha_i(E[c_i,c_j]).$$

It is straightforward to see that with a utility function of this form, the public good game has multiple equilibria if $\alpha_i$ is above the threshold $\alpha_i \geq \frac{2-e}{e}$ (with $e=1.5$ this condition becomes $\alpha_i \geq \frac{1}{3}$). In fact, with appropriate beliefs $E[c_j]$ all $c_i$, such that $0 \leq c_i \leq y_i$ can be equilibria. The extent to which subjects contribute to the common project in a public good game is viewed as a measure of cooperativeness, since all contributions such that $c_i > 0$ are signaling other-regarding preferences (either in the form of a higher $\alpha_i$ or as more positive beliefs about the contributions of the other player, $E[c_j]$).

In this experiment we test whether there is less cooperation in a group that is put together by an unrepresentative quota (treatment 1) than in the control treatment where all subjects are selected by performance (treatment 2). That implies that we are testing the null hypothesis of no difference in public good contribution against the alternative
hypothesis that there is a difference in average public good contribution between these two treatments. To understand the role of justification for the quota effect, we look at average contributions to the public good in treatments 1b and 1c respectively and test the null hypothesis that they are the same as in treatment 1 against the alternative hypothesis that they are, individually or jointly, different.

In Section 4 we will discuss different theories which could support a difference in cooperative behavior between the two treatments. As explained there, an important step to distinguish between the different mechanisms is to look at behavior broken down by whether the subject herself, and the person who she is matched to, belong to the group which is disadvantaged or advantaged by the unrepresentative quota. This implies that a first step to understanding the mechanism underlying the quota effect is to test the null hypothesis that the difference between public good contribution in treatments 1 and 2 is the same for all color-matches against the alternative hypothesis that they are not all the same.

As discussed above, the unrepresentative quota in treatment 1 (and 1b and 1c) captures two aspects of how affirmative action is often perceived: preferential treatment and an asymmetric role for merit in the selection of candidates from the different groups. In order to understand more about the role of these features in generating the quota effect we consider contributions to the public good in treatments 3 and 4. In both these treatments, selection is made randomly into the high stake group but whereas there is an unrepresentative quota for purples in treatment 3, subjects of both colors have the same chance of being selected in treatment 4. We test the null hypothesis of no difference in average contribution to the public good in these treatments against the alternative hypothesis that there is a difference.

3. Results

Our experimental design, with each subject making decisions in seven public good games, implies that there are multiple behavioral data points for each subject. It is hence
important to adjust standard errors for the fact that observations for a single individual are not independent. In the analysis below, this is done by clustering standard errors on individual.\textsuperscript{11} As an additional measure, in order to be as conservative as possible in testing our hypotheses, our tests utilize standard errors which are clustered at the level of experimental session.\textsuperscript{12}

3.1. Selection by performance: Treatments 1 and 2

We start by looking at the results for treatments 1 and 2. Treatment 1 is the unrepresentative quota treatment, where the four purple players were automatically selected for the high stake group whereas the orange players were selected based on their performance in the math task. In the high stake group in this treatment, average contribution in the public good game was 32.7 percent of the maximum contribution. Treatment 2 is the control treatment where four players of each color were selected by performance in the math task. Under this condition, contributions in the public good game were on average 54.7 percent. These data are outlined in Figure 1.

\[\text{[Figure 1 about here]}\]

The level of contributions in the control treatment is within the interval of 40-60 percent that Ledyard (1995) has defined as the most common in public good game experiment, whereas the contribution level in treatment 1 is lower. The difference in public good

\textsuperscript{11} Another way of handling the data is to calculate the average for each subject, and hence only use one data point per subject. The results reported here are not sensitive to the choice of either method.

\textsuperscript{12} See Fréchette (2012) for a discussion about potential session effects in laboratory experiments. The two-dimensional clustering (i.e. clustering on both individual and experimental session) that is used here is an extension of the standard cluster-robust variance estimator for one-dimensional clustering, see Cameron et al. (2011). The results reported here are not sensitive to whether clustering on session is included or excluded.
contribution between the two treatments is 22.0 percentages points, which in turn is highly statistically significant ($p<0.01^{13}$). We therefore have the following result:

*Result 1: There is significantly less cooperation in the public good game when the high stake group is put together by the unrepresentative quota than in the control treatment.*

We continue by breaking down the results by whether the player is orange (and hence disadvantaged by the unrepresentative quota in treatment 1) or purple (and hence advantaged by the quota in treatment 1). Figure 2 shows these data.

![Figure 2 about here]

We see that for the oranges, who were disadvantaged by the quota, we have an average contribution of 30.7 percent in treatment 1, compared to 54.2 percent in treatment 2, i.e. a quota effect of 23.5 percentage points ($p<0.01$). For the purples, the contribution levels are 34.8 percent and 55.1 percent in treatment 1 and 2 respectively, and the quota effect is hence 20.3 percentage points ($p<0.05$). In the control treatment, orange and purple subjects behave statistically similar and a difference-in-difference analysis reveals that the 3.2 percentage point difference in the quota effect between oranges and purples is not statistically significant. We therefore have the following result:

*Result 2: Both those disadvantaged and those advantaged by the quota cooperate less in the public goods game in the unrepresentative quota treatment compared to the control treatment.*

We continue our analysis of the results from treatments 1 and 2 by looking at whether there is a difference between how players act when they play the public good game with others who have the same color compared to those who have the other color. This is done in Figure 3.

![Figure 3 about here]

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13 This p-value and all other p-values reported below, unless otherwise noted, come from two-sided Wald tests with standard errors clustered as described above.
From the data shown in Figure 3 we can draw two conclusions. We first note that there is less cooperation in the public good game in the unrepresentative quota treatment than in the control treatment regardless of whether subjects play with someone who has the same color as themselves or the other color. The quota effect is 19.5 percentage points when subjects play with others who have the same color \((p<0.01)\) and 23.8 percentage points when the game is against someone of the other color \((p<0.01)\). The difference in difference is not statistically significant. A second conclusion is that there is an ingroup/outgroup effect similar to what has been found in previous research even if it is not what is driving the quota effect. Subjects contribute significantly less (on average 3.9 percentage points, \(p<0.05\)) when the person they are playing a game with does not have their color. However, even though significant, this effect is small compared to the quota effect of 22.0 percent (a Wald test where the null hypothesis is that the size of the two effects are the same size is rejected with \(p<0.01\)). Our third results is hence:

**Result 3:** Considering both the unrepresentative quota- and the control treatment, there is an ingroup/outgroup effect with subjects contributing more when playing with people of the same color. However, this is not driving the quota effect as this is present and has statistically not different regardless of whether the matched players have the same color or not.

As discussed above, a key step in investigating which mechanism that is underlying the quota effect is to examine at greater depth whether there are differences in how the people of the two different colors play with each other. The full detail of this is outlined in Figure 4.

[Figure 4 about here]

From the data in Figure 4 we see that there is less cooperation in the unrepresentative quota treatment than in the control treatment, regardless of the match between the player’s own color and the color of the person she plays with. The point estimate of the quota effect is largest when orange players play with purple players (24.1 percentage
points) and smallest when purple players play with other purples (16.3 percentage points). However, the quota effect is statistically significant for all combinations of colors (orange to orange: \( p<0.01 \), orange to purple: \( p<0.01 \), purple to purple: \( p<0.1 \), purple to orange: \( p<0.01 \)) and the differences in point estimates of the quota effect are not statistically different from each other. Our fourth result is therefore:

**Result 4:** The quota effect is present for all combinations of matched players’ colors and not statistically different in size between the different cases.

As described in Section 2, we also asked the subjects about whether they perceived the procedure through which the high stake group was selected as fair. We will now look at the data from these questions.\(^{14}\) Figure 5 outlines these data for treatments 1 and 2.

![Figure 5 about here](image)

From this figure we learn that 60.7 percent of subjects found the process fair in the unrepresentative quota treatment, compared to 80.3 percent in the control treatment. The difference of 19.6 is statistically significant (\( p<0.05 \)). We can therefore conclude that the unrepresentative quota was viewed as a more unfair process by the subjects than the process were everyone was selected based on performance.

### 3.1.1. Justification of the Unrepresentative Quota: Treatments 1b and 1c

As discussed in Section 2 some previous research suggests that the acceptance for affirmative action policies is higher when the policy is justified. We test if justifications of the unrepresentative quota have an effect on group cooperation with treatments 1b and 1c.

In treatment 1b an efficiency argument was given as rationalization for the quota. The subjects were told that the payoff rule for part 4 was such that the high stake group would

\(^{14}\) For the fairness data we only have one observation per subject (which is that subject’s assessment of the fairness of the procedure) and hence the above discussion about clustering on the level of the individual does not apply here. Reported p-values from test on fairness data come from two-sided Wald tests.
only have higher stakes than the regular stake group if the high stake group consisted of an equal number of orange and purple players. When the unrepresentative quota was introduced, it was done with reference to this payoff rule, pointing out that the unrepresentative quota was implemented as it guarantees equal representation of both colors in and hence higher endowments for all members of the high stake group. The result of this treatment in relation to treatments 1 and 2, is shown in Figure 6.

Figure 6 reveals that the contribution level in treatment 1b was 28.6 percent. This is not statistically different from the case with no justification and the difference of 26.0 percentage points between treatments 1b and the control treatment, treatment 2, is highly statistically significant ($p<0.01$).

In treatment 1c, the unrepresentative quota was rationalized as a compensation for previous unfair treatment. The four purple subjects had to do a harder math task (summing up three-digit numbers instead of two-digit numbers) without getting compensated in terms of higher payoffs per correct answer. The fact that they were all automatically selected for the high stake group was framed as making up for this unfairness. Figure 7 below outlines the extent to which subjects contributed in the public good game in treatments 1 and 1c, compared to treatment 2.

As is evident from Figure 7, the fact that the quota was given with this justification does not have a positive impact on the cooperation level, compared to the situation where the quota is not justified, as there is no statistical difference in cooperative behavior between treatments 1 and 1c. The difference between cooperation in treatment 1c and treatment 2 of 22.5 percentage points is however statistically significant ($p<0.01$). The analysis of treatments 1b and 1c, in addition to the analysis of treatments 1 and 2, hence gives us the following result:
Result 5: There is less cooperation when the group is put together by an unrepresentative quota, compared to the situation where everyone is selected by performance, also when the unrepresentative quota is justified with either an efficiency- or a fairness argument.

It is important to note that our results do not imply that there exist no possible justifications that would do the trick and increase cooperation in the unrepresentative quota treatment to the level that we see in the control treatment. However, they do suggest that the negative effect of the unrepresentative quota on cooperation is quite persistent.15

In Figure 8 we again look at the subjects’ perception of whether or not the selection process was perceived as fair and consider the two treatments where a justification of the unrepresentative quota was made.

[Figure 8 about here]

In Figure 8 we see that the two justifications had different effect on subjects. The efficiency reason that was given in treatment 1b did not work well as there was no statistically significant difference between the fairness perception in treatment 1 and 1b. However, with the fairness reason for the unrepresentative quota in treatment 1c, the selection was perceived more fair (p<0.1) than in treatment 1, where no reason for the quota was given.

These data add an interesting dimension to the results described above. Even though the argument used in treatment 1c worked in the sense that subjects did find the process more fair, it did not have an impact on behavior in the public good game, compared to the situation where no justification was given for the unrepresentative quota.

15 The reason that Section 3.1.1 does not describe the data from treatments 1b and 1c broken down by color of the player and/or the matched partner is that such an analysis does not add any new insights compared to what was discussed in the first part of section 3.1. For the interested reader the material is however available from the authors.
3.2 Random Selection: Treatments 3 and 4

In order to distinguish between the role played by the two aspects of quotas (preferential selection and an asymmetric role of merit) for generating the quota effect, we also implemented two treatments that were identical to treatments 1 and 2 with the difference that selection by performance in the math task was removed. Instead subjects were randomly selected into the high stake group. In treatment 3, which is our unrepresentative quota treatment with random selection, the four purple subjects were automatically selected into the high stake group. The four orange subjects, however, were randomly selected from a total of twelve orange subjects. In treatment 4, which is the control treatment with random selection, there were eight players of each color in each session and four of each color were randomly selected for the high stake group. Figure 9 outlines the data from treatment 3 and 4.

[Figure 9 about here]

From Figure 9 we learn that in treatment 3, contribution to the public good was 49.3 percent of the maximum whereas it was 41.3 percent in treatment 4. This difference of 8.0 percentage point is not statistically significant. Furthermore, a difference-in-difference analysis reveals that the quota effect is not the same when selection is made randomly as when it is made by performance ($p<0.01$). This gives us the following result:

*Result 6: When selection by performance is removed and subjects are instead selected randomly into the high stake group, there is no negative effect of the unrepresentative quota on cooperation in the public good game.*

This result highlights the importance of the selection mechanism for the quota effect to arise. When those who are disadvantaged by the quota are selected by performance in the math task there is a negative effect on cooperation from the unrepresentative quota, but this effect goes away when the selection is instead made randomly. From this we learn
that a preferential selection of one color above the other is not enough to trigger lower cooperation but that the difference in selection criteria, and the role of merit, is decisive.

In Figure 10 we again ask whether subjects find the process fair or unfair and consider this data for treatments 3 and 4.

Figure 10 reveals that whereas 62.8 percent found the selection process fair in treatment 3, the corresponding figure for treatment 4 was 95.6 percent. This difference of 32.8 percentage point is highly statistically significant ($p<0.01$). This is interesting as we also just concluded that there was no quota effect on cooperative behavior with random selection. This further underlines our conclusion that the effect that the unrepresentative quota has on cooperation is not primarily about stated fairness perceptions. Even though subjects found the unrepresentative quota in treatment 3 as unfair as in treatment 1, there was no quota effect when selection was made randomly instead of based on performance. Also, even though the subjects report that they view the unrepresentative quota as more fair when the justification in treatment 1b is given, this does not change the level of cooperation compared to when no justification is given.

3.3 Math task and Public Good Game – is there an Intrinsic Relation?
Since selection in treatments 3 and 4 is made randomly and no references to performance in the math task is made, data from these treatments allow us to also investigate whether there is an intrinsic relation between how well a person does in the math task and how she behaves in the public good game. Figure 11 shows a scatter plot of the number of correct answers in the math task against the percentage contribution in the public good game.

Figure 11 suggests that there is no relation between the two. This is also confirmed in regression analysis where the percentage contribution is regressed on the number of correct
answers in the math task as the coefficient on number of correct answers in the math task is insignificant.\textsuperscript{16}

This result tells us that the reason that we see less cooperation in treatment 1 than in treatment 2 is not an automatic consequence of an inherent relation between scoring high in the math task and behaving more or less cooperatively in the public good game.

4. Why a Quota Effect?

We have defined the quota effect as the negative impact that an unrepresentative quota has on cooperation, compared to the situation where everyone in the group is treated symmetrically and selected by performance. In this section we discuss different theories providing explanations to why we might see this effect, and relate them to the results from our experiment.

4.1 The Ingroup/Outgroup-Effect

A person’s social identity is usually defined as the sense of self that she derives from perceived membership in a social group. The seminal work of Billig and Tajfel (1973, see also Tajfel 1982) was the starting point for the empirical research on intergroup behavior in the laboratory. They showed that people have a tendency to put both themselves and others into basic categories and that this categorization gives rise to favorable treatment of the people in the same social group as oneself (the ingroup) compared to those in other groups (the outgroup), i.e people exhibit an ingroup bias.\textsuperscript{17}

The way the groups are created have been shown to matter for the strength of the ingroup bias, but also completely random formation of groups, for example by the flip of a coin,\textsuperscript{16} This is true also when we control for whether the participant was in treatment 3 or 4, the color which the participant was randomly given and whether or not she was randomly selected into the high stake group. See Table 1 for regression results with controls.

\textsuperscript{17} The term “minimal group paradigm” also come from this research and refers to the fact that the minimal conditions required for people to develop a group feeling and exhibit an ingroup bias are weak. See Chen and Li (2009) for a discussion of the original definition of a minimal group.

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have been documented to give rise to the effect (Billig and Tajfel, 1973; and Locksley et al., 1980).

The first experiments investigating the ingroup/outgroup-effect were done with subjects dividing a valuable asset (usually money or lottery tickets) between another member of the ingroup and a member of the outgroup, i.e. they could not allocate anything to themselves. (see Tajfel and Turner, 1986; and MacDermott, 2009 for surveys). However, experimental economists have also considered situations where the individual herself has money at stake in the decision, for example in the form of a dictator game or a prisoners’ dilemma. Bernard et al. (2006), Goette et al. (2006) and Chen and Li (2009) have shown that an ingroup bias arise in such situations as well, with people behaving more altruistic and cooperative towards people in the ingroup.

In a setting with quotas and affirmative action the ingroup bias may matter in several ways. First, it is likely that there will be a difference in how people treat others depending on whether they belong to the same or the other group, regardless of any preferential selection. Second, we know from the work of for example Eckel and Grossman (2005) that the ingroup/outgroup-effect is stronger when a group has more in common. With affirmative action and quotas the group identities are likely to be stronger since the groups are treated differently in selection. A sufficiently strong decrease in cooperation with the outgroup (compared to a potential increase in cooperation with the ingroup) could then lead to a decline in overall cooperation, as a consequence of the unrepresentative quota.

Our findings in the experiment are, however, not consistent with what a quota effect driven by the ingroup/outgroup bias would look like. More precisely, if it was a stronger feeling of ingroup/outgroup that was the difference between the control treatment and the quota treatment, we would see the quota effect being stronger when subjects play with those of the other color. As this is not what we observe, we can conclude that even though there is an ingroup/outgroup effect in the sense that subjects in both treatments
cooperate slightly more with those of the same color, this is not what is driving the quota effect.

4.2 Entitlement and Punishment

Other phenomena that could give rise to less cooperation in a group put together by an unrepresentative quota is related to entitlement and punishment. Entitlement is a key concept in the literature on procedural fairness, and it has for example been shown that an experimental subject who earns resources in an experiment, for example by correctly answering a quiz, is less inclined to share these resources with other subjects (who did not earn the money) than if the resources were allocated randomly (Hoffman et al., 1996 and Cherry, 2001). Furthermore it has been shown that the entitlement of others is respected, for example in the sense that a recipient in an ultimatum game accepts lower offers when the proposer earned the money compared to when it was randomly allocated (Hoffman et al., 1994 see also Oxoby and Spraggon, 2008).

Similarly, we also know that there is a tendency for people to punish those who behave in a non-approved way (for example by free riding) or who get undeserved benefits (see e.g. Fehr and Gächter, 2000; and Fehr and Fischbacher, 2004). In our case it is not implausible that those who are disadvantaged by the quota could feel both an entitlement to more resources and/or a willingness to punish those who were advantaged by the preferential treatment. This could then give rise to less cooperation in groups created by an unrepresentative quota, compared to a situation where everyone is selected by merit.

However, again the results that we observe in the experiment are not in line with this hypothesis. If punishment would be the main underlying factor behind the quota effect, we should not see an effect of the quota when those disadvantaged by the quota, i.e. the orange subjects, play with other of the same color, as they have no reason to punish others who are similar to them. A feeling of entitlement induced by the quota treatment could, on the other hand, have an impact also when the orange members of the high stake group play with each other, but it should not make a difference in the case when the advantaged, i.e. purple, subjects play with each others. As we see a quota effect of
similar size regardless of the subject’s own color and that of the matched player, we can conclude that the effect is not driven primarily by punishment or entitlement.

4.3 (Perceived) Competence

There is an extensive literature in psychology on the impact of preferential treatments and a main focal point of this literature is on competence. Preferential selection in the form of affirmative action and quotas has been shown both to impact how others view the competence of the selected person (see e.g. Garcia et al., 1981; Heilman et al, 1992, 1997) and how the person perceives her own competence (Heilman et al, 1987, 1990, 1991). The most common conclusion is that quotas and affirmative action lead to a situation where people who are preferentially selected are viewed as less competent, both by others and by themselves (see also Nacoste, 1994).

In situations outside the laboratory, competence is often hard to define. In our stylized setting, where groups are created by randomly giving subjects one of two colors and where interaction is anonymous, the perception of competence will be linked to performance in the math task that is used as selection device. There are two ways that the performance in this task may matter for the quota effect. First, there may be an inherent relation between how many math problems an individual can solve and how she behaves in a social dilemma. Since the competence level of the privileged group selected by the unrepresentative quota will, with our design, by necessity be lower than when all members are selected by performance in the math task, this may give rise to the quota effect.

Second, there is the question of how subjects view each others’ competence and what beliefs they hold about whether there is a relation between math task solving ability and public good game behavior. Even though there is, to our knowledge, no previous research that looks at this specific math task, there is a small literature considering the effects of cognitive ability on altruistic and cooperative behavior. The evidence is mixed (see Rustichini et al., 2011, Benjamin et al., forthcoming and Mollerstrom and Seim, 2012) but the fact that no unambiguous relation has been found does not mean that
people may not form beliefs regarding this. If beliefs are that people who get more math problems right are more cooperative, and that the competence in the group declines with the unrepresentative quota, this may explain the quota effect.

Going back to the results of our experiment, we can first conclude that the quota effect is not driven by an inherent relation between performance in the math task and behavior in the public good game, as we find no such relation in treatments 3 and 4 (see Section 3.3 above). Second, we can also conclude that beliefs about competence also are not the main driver of the quota effect, as this should not give rise to a symmetric decline in the quota treatment compared to the control treatment, regardless of the color-match of the players.

4.4 Procedural Justice as Social Motivation

Above we have discussed theories of the ingroup/outgroup effect, punishment and entitlement, and perceived competence. We concluded that our results are inconsistent with either of these mechanisms being the main driver behind the quota effect. The obvious question is hence: what theories and previous research are the results consistent with?

First, there is a strand of literature in the psychology research on affirmative action which focuses on how preferential selection impacts people’s general sense of interest and motivation. This question has been regarded as particularly important since affirmative action is often implemented in the work place. Many attempts to answer this question have reached the conclusion that when some employees or team members are selected using affirmative action, motivation, interest and social interactions can be negatively affected. Most importantly, this has been found to be true both for those who are advantaged and those who are disadvantaged by the preferential selection. (Chacko, 1982; Heilman et al., 1987, 1990; 1991, 1996. See also McFarlin and Sweeney, 1991.)

Second, in the procedural justice literature, a process which is perceived as fair and just is regarded as a source of social motivation, i.e. it is believed to increase cooperative
behavior. Moreover, this effect has been showed both in the case where the outcome following the procedure was one which was favorable to the agents, and in the case where the outcome was unfavorable (see e.g. Tyler and Huo, 2002; and Tyler and Blader, 2005).

Our finding, that there is a quota effect for both those who were disadvantaged and those who were advantaged by the quota, and that the effect is of similar size regardless of which of these two groups the matched player belongs to, is in line with the above findings of a general impact of affirmative action and quotas.

Neither the procedural justice research nor the psychology literature about affirmative action has much to say regarding the exact mechanism that underlie the decrease in motivation, interest and cooperativeness that follows in the wake of procedures which are perceived as unjust. These results can, however, be related to the growing literature on how our moods and emotions impact our decision making. It has been shown that moods such as fear, anger, happiness and disgust can significantly change economic decision making. In the context of affirmative action, moods such as anger and annoyance are likely to become relevant.\(^\text{18}\)

One way to deepen our understanding further about why the quota effect arises in our experiment would, in light of the above discussion, be to utilize some of the sophisticated measures of emotions and moods that have started to make important contributions to our understanding of decision making. By using Likert-type scales, physiological measures

\(^{18}\) It has indeed been shown that people who are induced to feel anger (or have a higher baseline measure of anger) are less other-regarding in negotiations and behave less cooperatively, see e.g. van Kleef et al., 2004; Lerner and Tiedens, 2006; and Small and Lerner, 2008. Another possibility is that affirmative action causes those selected from the majority to feel happy and accomplished for having made it despite the preferential selection applied to the minority. Such feelings have also been shown to lead to less cooperative behavior in the lab (see e.g. Andrade and Ariely, 2009 and Tan and Forgas, 2010).
or other tools, it would be possible to understand if particular emotions, such as anger or annoyance, lie behind the quota effect.\textsuperscript{19} 

5. Conclusions

Affirmative action and quotas are widely used policies that are often successful in achieving desired numerical representations. However, there are also many examples of unwanted negative side effects in the form of uncooperative and inefficient behavior in the groups that are put together by quotas. We conduct a laboratory experiment in order to investigate whether it is indeed the case that groups put together by an unrepresentative quota cooperate less than groups where everyone is treated symmetrically and selected by merit.

We create groups by randomly allocating colors to subjects. In our unrepresentative quota treatment, we create a privileged group by automatically selecting all subjects of one color whereas subjects of the other color are selected in competition with each other, based on their performance in a previous task. We measure cooperation as the level of contribution in a two-person public good game and compare the level of cooperation in the unrepresentative quota treatment to a control treatment where subjects of the two colors are treated symmetrically and everyone is chosen by performance.

Our results show significantly less cooperation in the unrepresentative quota treatment and we furthermore find that this effect arises both for the players who are advantaged and those who are disadvantaged by the quota. The unrepresentative quota also has the same negative effect on cooperation regardless of the color of the other player. These results are contradicting some prominent theories, for example the common prediction that the disadvantaged will punish the advantaged.

We furthermore find that the level of cooperation remains low in the group that is put together by the unrepresentative quota also when a justification is given for the

\textsuperscript{19} See Coan et al. (2007) for an overview of the literature on emotion elicitation and assessment.
preferential selection. However, the negative effect of the quota on cooperation goes away when the selection criteria for the privileged group is changed from performance based to random, i.e. by removing selection by performance entirely we can turn the quota effect off. This implies that the quota effect is tied to the fact that the subjects who are selected into the privileged group under the unrepresentative quota are chosen by different criteria.

There are several policy implications of our findings. For example, we note that the fact that the unrepresentative quota affects all relations in the group, and not only those between the disadvantaged and the advantaged, can potentially make negative effects of affirmative action harder to detect. In organizations where affirmative action or quotas are used one often looks for differences in how people treat each other as an indication of negative effects of the policy. If no such differences are found, the conclusion may mistakenly be that all is well, even though the behavior in all relations in the group may be negatively affected by the policy.

Another important policy lesson is that there is a difference between paying lip service to a policy and behaving in accordance with its intentions. When we introduce a fairness reason for the quota, subjects move toward finding the unrepresentative quota more fair – in fact they find the selection process as fair as in the control treatment. However, they do not change their cooperative behavior but continue to contribute as little in the public good game as when no justification is given. This indicates that even though people may state that they find a policy justified or fair, the desired impact on behavior may fail to materialize.

It is important to be aware that all conclusions drawn in the laboratory may not translate into other settings. In group interactions outside the laboratory, for example on boards, in schools and in the workplace, there are additional factors which are not captured in the laboratory that may play a role. An obvious example is the fact that relations outside the laboratory are generally more long-lasting. Also, in the “real world” affirmative action policies are applied to groups of people which already have associations and prejudices
attached to them. This may play a role in how the quota is perceived and is a factor that
we, since we randomly allocate group, do not study in this paper. However, the fact that
we do find an effect from preferential selection also in the abstract, short-lived and
“stripped down” environment of the laboratory is an indication that this effect can arise
also under minimal conditions and hence potentially is strong.

As the use of affirmative action policies and quotas spreads, it is increasingly important
to understand their effects on how groups function. This paper is a contribution to that
research, but many questions remain unanswered. As discussed in Section 4.4 it would,
for example, be interesting to conduct a version of our experiment where measures of
emotions and moods are utilized in order to investigate more specifically the effects that
the unrepresentative quota has on subjects.

Small alterations to the designed used in this paper would also allow us to answer
questions about whether an asymmetric role of merit in itself causes less cooperation, or
if it is the combination together with preferential treatment that gives rise to the quota
effect. Finally it would be interesting to examine other group compositions that the ones
used here; would the results change if the underlying group consisted or, for example,
five purples and eleven oranges instead of four and twelve respectively? In order to better
understand the way affirmative action and quotas impact group cooperation, we plan to
address these, and other, topics in future work.
References


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Tables and Figures

Figure 1: Contribution in PG game, High Stake group, Treatment 1 and 2.

Error bars mark standard errors for average observation per subject. Number of observations: 560, number of subjects: 80, number of session: 10.

Figure 2: Contribution PG game, High Stake group, Treatment 1 and 2, by Color.

Error bars mark standard errors for average observation per subject. Number of observations: 560, number of subjects: 80, number of session: 10.
Figure 3: Contribution in PG game, High Stake group, Treatment 1 and 2, by Color of Matched Partner.

Error bars mark standard errors for average observation per subject. Number of observations: 560, number of subjects: 80, number of session: 10.

Figure 4: Contribution in PG game, High Stake group, Treatment 1 and 2, by Color of Matched Partner.

Error bars mark standard errors for average observation per subject. Number of observations: 560, number of subjects: 80, number of session: 10.
**Figure 5: Fairness Perception, Treatments 1 and 2**

Data are from High Stake- and Regular Stake Group and show percentage of subjects who found the selection process into the High Stake Group fair. Bars mark standard errors. Number of observations = Number of Subjects: 160, Number of session: 10.

**Figure 6: Contribution in PG game, High Stake group, Treatment 1, 1b and 2.**

Data are from High Stake Group. Error bars mark standard errors for average observation per subject. Number of observations: 728, number of subjects: 104, number of session: 13.
Figure 7: Contribution in PG game, High Stake group, Treatment 1, 1c and 2.

Data are from High Stake Group. Error bars mark standard errors for average observation per subject. Number of observations: 728, number of subjects: 104, number of session: 13.

Figure 8: The Impact of Quota Justification on Fairness Perception

Data are from High Stake- and Regular Stake Group and show percentage of subjects who found the selection process into the High Stake Group fair. Bars mark standard errors. Number of observations = Number of Subjects: 256, Number of session: 16.
Figure 9: Contribution in PG game, High Stake group, Treatment 3 and 4.

[Bar chart showing percentage of PG contribution for Unrep. Quota (T3) and Control (T4).]

Error bars mark standard errors for average observation per subject. Number of observations: 336, number of subjects: 48, number of session: 6.

Figure 10: Fairness Perception, Treatments 3 and 4

[Bar chart showing percentage of subjects who found the selection process fair for Unrep. Quota (T3) and Control (T4).]

Data are from High Stake- and Regular Stake Group and show percentage of subjects who found the selection process into the High Stake Group fair. Bars mark standard errors. Number of observations = Number of Subjects: 256, Number of session: 16.
Figure 11: Math Task Performance and public good contribution, Treatments 3 and 4

Data are from High Stake- and Regular Stake Group. N=96. Dark gray dots denote Treatment 3 and light gray dots denote Treatment 4.

Table 1: Math Task Performance and public good contribution, Treatments 3 and 4

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OLS. Levels of significance: * p<0.1, ** p<0.05, *** p<0.01. Dependent variable: Percentage public good contribution. High Stake Group is a dummy equal to 1 if the subject was randomly chosen as a member of the high stake group. Orange is a dummy equal to 1 if subject is orange. Quota is a dummy equal to 1 for treatment 3.
Appendix A: Experimental Instructions

[Screen 1:]
Hi and welcome! In this study you can earn some money. The amount will depend on your decisions and the decisions of the other participants. The study has one introductory part and several parts where you can earn money. At the end of the study, your earnings (10 points correspond to $3) will be added to the show-up fee of $10 and you will be paid in private, in cash before you leave. We will go through the instructions now. If you have any questions after you have read and heard the instructions, please press the help button or raise your hand. Otherwise, no communication is permitted during the study. You are also not allowed to use mobile phones or other electronic devices.

[Shown in treatment 1, 1b, 1c and 3] There are 16 people, including you, participating in this study at the same time as you. You are all in this room. The 16 of you are divided into two colors: orange and purple. There are 12 orange people and 4 purple people. On the next screen you will learn which color you have.

[Shown in treatment 2 and 4] There are 16 people, including you, participating in this study at the same time as you. You are all in this room. The 16 of you are divided into two colors: orange and purple. There are 8 orange people and 8 purple people. On the next screen you will learn which color you have.

[Screen 2:]
Your color is: [ORANGE/PURPLE]. There is a total of [12/4/8/8] [ORANGE/PURPLE] people, including you. The other color is [PURPLE/ORANGE]. There are [4/12/8] [purple/orange] people. Please do not press the OK button until we have given you a wrist-band with your color.

[Screen 3:]
Use the paper and pen that are available on your desk. Write down a list of 5 associations to your color, which is [ORANGE/PURPLE]. You have a total of 2 minutes available for this task. When you have finished, press the OK button. [Papers collected after 2 minutes and a paper with key info about next part given out.]

[Screen 4:]
[Shown in treatment 1, 1b, 2, 3 and 4] We now move on to the first part of the study where you can earn money. In this part of the study you are asked to correctly solve as many math problems as possible. You have five minutes available. In each problem, you
are asked to sum up five two-digit numbers. An example could be $32+97+13+62+20$. In this case the correct answer is 224. For each correct answer you will receive 1 point. At the end of the study you will learn how many of your answers were correct and how many points you earned. This will then be converted to dollars and paid out in cash. Please make sure to stop solving and press the OK button when we tell you that the time limit is up. Failing to do so can negatively affect your payoffs. If you have finished all the tasks before the time limit is up, press ok and then wait until the study continues.

[Shown in treatment 1c] We now move on to the first part of the study where you can earn money. In this part of the study, the first part, you are asked to correctly solve as many math problems as possible. You have five minutes available. In each problem, you are asked to sum up five numbers. The math task can be either easy or hard. If it is easy, the numbers have two digits. An example could then be $32+97+13+62+20$. In this case the correct answer is 224. If it is hard, the numbers have three digits. An example could then be $223+761+130+409+901$. In this case the correct answer is 2424. Regardless of whether the math task is easy or hard, you receive 1 point for each correct answer. The orange players do the easy math task and the purple players do the hard math task. At the end of the study you will learn how many of your answers were correct and how many points you earned. This will then be converted to dollars and paid out in cash. Please make sure to STOP solving and press the OK button when we tell you that the time limit is up. Failing to do so can negatively affect your payoffs. If you have finished all the tasks before the time limit is up, press ok and then wait until the study continues.

[Screen 5:] We will now check that everyone has understood the instructions for part 1 correctly! Please answer the questions on this screen. If you need help, please press the help button or raise your hand. When you have finished answering, please press "I understand". If any of your answers are incorrect, the program will tell you so and you get to answer that question again. [Quiz is given.]

[Screen 6:] The math solving task will start in a few moments.

[Screen 7:] Add up the five numbers in each row and write the sum in the box labeled "total". Please make sure to STOP solving and press the OK button when we tell you that the time limit is up. [Math tasks on screen.]
[Screen 8:]
It has now been determined how many of your answers were correct. At the end of the study, you will learn how many correct answers you gave and the money you earned will be given to you in cash. We now move on to part 2 of the study where you can earn more money. Please do not press OK until you have received the paper with the key information about part 2. [Paper with key info about part 2 handed out].

[Screen 9:]
We now move on to part 2 of the study. In this part two different groups will be formed. 8 out of the 16 people in this room will be members of a HIGH STAKE GROUP. The other 8 will remain in the study as members of the REGULAR STAKE GROUP. The people who are selected for the high stake group will have the chance to earn more money than those who are in the regular stake group.

[Shown in treatment 1b:] The payoff rule in part 2 is as follows: If the high stake group consists of an equal number of purple and orange participants, the payoffs in the high stake group will be twice as large as in the regular stake group. If the high stake group does not consist of an equal number of purple and orange participants, the payoffs in the high stake group will be the same as in the regular stake group.

[Shown in treatment 1, 1b, and 1c:] The 8 high stake group members will consist of 4 orange and 4 purple players. Since there are only 4 purple participants, the 4 purple high stake members are simply these 4. The 4 orange high stake members are the 4 orange participants, out of the totally 12 orange participants, who solved most math problems correctly in part 1.

[Shown in treatment 3:] The 8 high stake group members will consist of 4 orange and 4 purple players. Since there are only 4 purple participants, the 4 purple high stake members are simply these 4. The 4 orange high stake members are 4 randomly chosen orange participants, out of the totally 12 orange participants.

[Shown in treatment 1b:] The reason that all the purple participants are selected as members of the high stake group is that this group then has an equal number of orange and purple participants. Thereby the payoffs for all high stake group members are doubled.

[Shown in treatment 1c:] The reason that all the purple participants are selected as members of the high stake group is that they thereby are compensated for the fact that their math task was harder in Part 1.
[Shown in treatment 2:] The 8 high stake group members will consist of 4 orange and 4 purple players. The 4 purple high stake members are the 4 purple participants, out of the totally 8 purple participants, who solved most math problems correctly in part 1. The 4 orange high stake members are the 4 orange participants, out of the totally 8 orange participants, who solved most math problems correctly in part 1.

[Shown in treatment 4:] The 8 high stake group members will consist of 4 orange and 4 purple players. The 4 purple high stake members are 4 randomly chosen purple participants, out of the totally 8 purple participants. The 4 orange high stake members are 4 randomly chosen orange participants, out of the totally 8 orange participants.

You will shortly be informed about whether you have been selected as a member of the high stake group or whether you remain in the study as a member of the regular stake group. After the high stake group has been formed, everyone will play a game. The game will be identical for everyone, but the people in the high stake group will have the chance to earn more money. We will go through the instructions for the game in part 2 now. Please press the OK button.

**[Screen 10:]**

THE GAME: This game is played in pairs so you will play with one person at a time. Every person will play the game seven times with seven different people. At the end of the study, you will get paid according to the outcome of one randomly chosen game out of the seven. What you earn in that game will be converted to dollars and paid out in cash together with your other earnings. In this game both people in the pair start with an endowment of a certain number of points. Your task is to choose how much of your endowment to keep and how much to contribute to a project. The sum of the points that you, and the person you are playing with, contribute to the project will be multiplied by 1.5. The resulting number of points will then be divided equally between the two of you. Your earnings will hence be whatever you keep plus your share of the payoff from the project.

There are two differences between the high stake group and the regular stake group. 1. Everyone will only play with members of their own group. I.e. members of the regular stake group will play with each other and the member of the high stake group will play with each other. 2. The endowment is 10 points in the regular stake group and 20 points in the high stake group. I.e. members of the high stake group have the chance to earn more money. Let’s now look at two examples.

EXAMPLE 1: A game in the regular stake group. Imagine that you are a player in the regular stake group and hence you play with another member of the regular stake group.
You both have an endowment of 10 points. You contribute 4 points to the project and the person you are playing with contributes 6 points. The sum of the contributions is then 4+6=10 points. The final payoff from the project will be 10*1.5=15 points. This will be divided between you and the person you are paired with so that you both get 15/2=7.5 points from the project. Since you kept 6 points out of your original 10, you will end up with 6+7.5=13.5 points from this game. The other person kept 4 points and will get 4+7.5=11.5 points.

EXAMPLE 2: A game in the high stake group. Imagine that you are a player in the high stake group and hence you play with another member of the high stake group. You both have an endowment of 20 points. You contribute 12 points to the project and the person you are playing with contributes 8 points. The sum of the contributions is then 12+8=20 points. The final payoff from the project will be 20*1.5=30 points. This will be divided between you and the person you are paired with so that you both get 30/2=15 points from the project. Since you kept 8 points out of your original 20, you will end up with 8+15=23 points from this game. The other person kept 12 points and will get 12+15=27 points. Please click OK.

[Screen 11:]
We will now check that everyone has understood the instructions for part 2 correctly! Please answer the questions on the screen. If you need help, please press the help button or raise your hand. When you have finished answering, please press "I understand". After everyone has finished answering the questions below, we will announce if you have been selected for the high stake group or not. [Quiz is given.]

[Screen 12:]
[Shown to those selected for the high stake group:] You have been selected as a member of the high stake group. You will now play the game with each of the other seven members of the high stake group.

[Shown to those not selected for the high stake group:] You have not been selected as a member of the high stake group. Hence you remain in the study as a member of the regular stake group. You will now play the game with each of the other seven members of the regular stake group.

[Screen 13:]
[Shown to those in high stake group:] You are a member of the high stake group and you will play the game with each of the other 7 members of the high stake group. All 7 games are carried out at the same time. The game is played anonymously and the only thing you know about the person you play a certain game with is that person's color. In each game
you have 20 points. You have to decide how many points to keep and how many to contribute to the project. When you have made your choice in all games, please press OK.

[Shown to those in regular stake group:] You are a member of the regular stake group and you will play the game with each of the other 7 members of the regular stake group. All 7 games are carried out at the same time. The game is played anonymously and the only thing you know about the person you play a certain game with is that person's color. In each game you have 10 points. You have to decide how many points to keep and how many to contribute to the project. When you have made your choice in all games, please press OK.

[Screen 14:]
All 7 games have now been conducted and one game has been chosen randomly for payment. You will learn the outcome at the end of the study, just before your earnings are paid out in cash. We now move on to part 3, which is the last part of the study. Please press OK to proceed to part 3.

[Screen 15:]
Now we would like to know how you believe that the players in your group (the [high stake / regular stake] group) acted in the game that you played in part 2. Please answer the questions below about how you think the other players in your group acted ON AVERAGE. If your answer is exactly correct you receive 30 points. If your answer is correct plus/minus 1 point you receive 20 points. If your answer is correct plus/minus 3 points you receive 10 points.

[Screen 16 to end:]
While we prepare your payments, please answer a few questions.

[Questions about fairness perception, gender, age, ethnicity, etc given]
Appendix B: Math Task Performance

Figure A-1: Distribution of Math Task Performance

Number of subjects with specific number of correct answers to math task. Number of subjects: 352.

Table A-1: Correlates of Math Task Performance

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<td>(0.34)</td>
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<td>(0.04)</td>
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<td>Non-white</td>
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<tr>
<td></td>
<td>(0.34)</td>
<td>(0.34)</td>
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<td></td>
</tr>
<tr>
<td>Three-digits</td>
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<td>-2.42**</td>
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<td></td>
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<td>(0.93)</td>
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<td>(0.93)</td>
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<tr>
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<td>12.26***</td>
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<td></td>
<td>(0.26)</td>
<td>(0.98)</td>
<td>(0.23)</td>
<td>(1.02)</td>
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OLS. Levels of significance: * p<0.1, ** p<0.05, *** p<0.01. Dependent variable: Number of correct math tasks. Female: dummy equal to 1 if female. Age: age in years. Non-white: dummy equal to 1 if subject has ethnicity other than white. Three-digits: dummy equal to 1 if subject solved math task with three digits (true for N=12 in treatment 1b).
Appendix C: Sessions Fall 2011 and Spring 2012

Figure A-2: Results of treatments 1 and 2: fall 2011, spring 2012 and pooled


Table A-2: Regression results of treatments 1 and 2: fall 2011, spring 2012 and pooled

<table>
<thead>
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<tr>
<td>Quota*Spring</td>
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<td></td>
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<td></td>
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<td>(0.09)</td>
<td>(0.05)</td>
<td>(0.07)</td>
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<td>224 (32)</td>
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</table>

OLS. Levels of significance: * p<0.1, ** p<0.05, *** p<0.01. (1): Only data from fall 2011. (2): Only data from spring 2012. (3) and (4): Pooled data.
Appendix D: Orange and Purples

Figure A-3: Percentage Female, Orange and Purple

Error bars mark standard errors. No difference between colors (p>0.1 in two-sample t-test with equal variances). Number of subjects: 352.

Figure A-4: Mean Age, Orange and Purple

Error bars mark standard errors. No difference between colors (p>0.1 in two-sample t-test with equal variances). Number of subjects: 350.
Figure A-5: Percentage Non-White, Orange and Purple

Error bars mark standard errors. No difference between colors ($p>0.1$ in two-sample t-test with equal variances). Number of subjects: 313.