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The Flipside of Comparative Payment Schemes

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The Flipside of Comparative Payment Schemes*

Thomas Buser and Anna Dreber

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Abstract

Comparative payment schemes and tournament-style promotion mechanisms are ubiquitous in the work place. We test experimentally whether they have a negative impact on the willingness to cooperate. Participants first perform in a simple task and then participate in a public goods game. The payment scheme for the task varies across treatment groups. Compared to a piece-rate scheme, individuals in a winner-takes-all competition are significantly less cooperative in the public goods game. A lottery treatment, where the winner is decided by luck, has the same effect. In a competition treatment with feedback, winners cooperate as little as participants in the other treatments, whereas losers cooperate even less. All three treatments lead to substantial losses in the realised social surplus from the public good while having no significant impact on performance. The public goods game is payoff-independent and is played with a separate set of others; we therefore estimate a psychological effect of comparative pay on the willingness to cooperate.

Introduction

Many companies use relative reward schemes whereby employees earn a bonus if they perform better than their colleagues. Moreover, hierarchical structures mean that in many organisations, employees find themselves in a constant competition for promotions. This is meant to provide incentives for higher performance. Often, however, the success of a project depends not only on individual performance but also on the willingness of people within an organisation to cooperate with each other. Here, we ask whether comparative payment schemes have a detrimental psychological effect on the willingness to cooperate. That is, we ask whether such schemes negatively affect an individual's willingness cooperate, even when cooperation does not affect the probability of earning a bonus.

To answer this question, we conduct an online experiment with a large subject pool in which participants are randomly allocated to perform a simple task under different incentive schemes.

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Following the task, we measure their willingness to cooperate in a public goods game with a randomly selected group of other participants whom they have not previously interacted with.

Participants in the control group are paid according to a piece-rate whereas those in the "Competition" treatment are paid according to a competitive winner-takes-all incentive scheme. In the "Lottery" treatment, participants are paid according to a lottery scheme which reproduces the payoff variance, but not the performance-dependence, of the competitive payment scheme: the winner is randomly chosen. Finally in the "Feedback" treatment, participants compete and are informed about the outcome of the competition before making their choice of how much to contribute to the public good.

The Lottery treatment serves to establish whether the effect is the same when the outcome is due to luck rather than performance, which mimics comparative pay based on a (very) noisy performance measure. The Feedback treatment eliminates the role of beliefs about the outcome of the competition. It also allows us to investigate whether feedback on the outcome, which is usually present in a workplace context, has an additional effect on cooperation.

An extensive literature finds that people are willing to cheat to artificially increase their own performance, lie about their performance or sabotage the performance of others in order to win a competition (e.g., Lazear, 1989; Konrad, 2000; Chen, 2003; Falk et al., 2008; Harbring and Irlenbusch, 2011; Charness, Masclet and Villeval, 2013). A number of past studies have looked at other potential side effects of different forms of competition and rivalry. Brandts, Riedl and van Winden (2009) find that what they dub competitive rivalry -- Player A chooses between Players B and C to play a prisoner's dilemma -- diminishes the rivals' altruistic disposition towards each other and the A player, mainly due to negative emotions linked to loss of control and exclusion. Savikhin and Sheremeta (2010) find that simultaneous participation in a public goods game and a lottery contest decreases sub-optimal overbidding in the contest but public goods game contributions are not affected compared to when these games are played in isolation. Balafoutas and Sutter (2012) find that affirmative action schemes favouring women in a competition do not affect efficiency in a subsequent coordination game relative to standard competition. Gill, Prowse and Vlassopoulos (2013) find that participants in an experiment who are paid according to a lottery are slightly more likely to cheat vis-a-vis the experimenter compared to participants who are paid a fixed wage. Closest to our design is Chen (2010), who also allocates participants to either a competitive or a piece-rate payment scheme and finds that competition increases non-utilitarian value choices in the moral trolley problem. Moreover, after providing feedback, he finds that competition winners are more likely to donate 10 cents to charity than losers.

There are also a number of field experiments, which look at the side effects of competition. Bandiera, Barankay and Rasul (2012) find that competitive incentives for fruit pickers change team composition (workers choose to work with others of a similar performance level rather than with friends) and lead to an overall productivity loss, probably due to a loss of social connections. Goette et al. (2012) conduct a lab-in-the field experiment in the Swiss army using naturally occurring groups (army platoons). They find that between-group competition increases the incidence of anti-social punishment of out-group members.

Also somewhat related are a couple of recent papers on the effects of market interactions on morality and social preferences. Falk and Szech (2013) let participants in a lab experiment decide between receiving money or saving the life of a "surplus" lab mouse. Participants are more likely to save the mouse when the decision is individual than when they make the decision through a multilateral market mechanism. Herz and Taubinsky (2013) show that exposure to market pressure serves as an anchor and lowers the minimum amount participants are willing to accept in an ultimatum game but not the amount they offer to others. Al-Ubaydli et al. (2013), on the other hand, find that priming participants using phrases related to markets and trade increases trust in a trust game through a positive effect on the beliefs about others' trustworthiness compared to a control group.

Our study adds to these previous findings in several ways by asking whether organisations face a trade-off between incentivising their workers and fostering a cooperative environment. In our design, the cooperative game involves a different set of participants from the task stage. This allows us to exclude reciprocity and punishment motivations as mechanisms. Also, the effects we measure differ from the effects uncovered in past experimental studies on sabotage and cheating, as in our design, cooperating does not affect the chance of winning. Rather, our design measures a psychological effect, which exists over and above the potentially perverse incentive effects of comparative payment schemes.

We find that participants in the Competition treatment, who are forced to compete, contribute significantly less in the public goods game compared to those who are paid a piece-rate, suggesting a negative effect of competition on the willingness to cooperate with others. Participants in the Lottery treatment cooperate as little as those in the Competition treatment, suggesting that the negative effect of comparative payment on the willingness to cooperate is present when the outcome is due to pure luck, and is therefore not caused by participants having to perform under competitive pressure. In the Feedback treatment, we find that winners cooperate as little as participants in the Competition and Lottery treatments, demonstrating that pessimistic beliefs about one's own performance cannot explain the competition effect. The Feedback treatment's losers

contribute even less than the winners and, overall, participants in the Feedback treatment contribute significantly less than participants in the Competition and Lottery treatments, showing an effect of feedback over and above the effect of comparative pay. All three treatments lead to substantial losses in terms of the realised social surplus compared to the piece-rate scheme while having no significant impact on performance in the task.

We interpret these results as evidence of a detrimental effect of competitive environments on people's mind-sets. Every organisation has to decide how to incentivise its employees and our results suggest that, by putting people into an uncooperative mind-set, competitive incentive schemes might carry a substantial negative externality in situations where cooperation is important for achieving an organisation's goals.

Following a large literature which finds strong gender differences in the reaction to competition (Gneezy, Niederle and Rustichini, 2003) and taste for competition (Gneezy and Rustichini, 2005; Niederle and Vesterlund, 2007), we also analyse whether the effect of competition on cooperation is different for men and for women. We find that effects are generally stronger and more significant for the male sub-sample.

Experimental design and data collection

Participants were recruited on Amazon's Mechanical Turk (MTurk) online labour market. MTurk is a platform where employers can recruit workers for short tasks in exchange for small payments (tasks are typically less than 5 minutes and participants earn typically less than $1). MTurk has become increasingly popular with researchers across the social sciences as a platform for running incentivised experiments. Replication studies have found that despite the small amounts which are typically paid, results are very similar to those obtained in the lab (Horton, Rand and Zeckhauser, 2011; Amir, Rand and Gal, 2012), while MTurk makes it feasible to recruit much larger samples at a substantially lower cost.

After accepting to participate in our study, participants on MTurk were referred to an external website (Qualtrics) and were randomised into one of four treatments, each consisting of two rounds. They were told that one of the two rounds would be randomly selected for payment. In the first round of all treatments, participants had to perform a simple task during two minutes. The treatments differ in the way participants were paid for their performance (see Table 1). Participants allocated to the control group were paid according to a piece-rate of 4 cents per point. Those in the Competition treatment had their performance compared to three other randomly selected

performances and were paid 16 cents if they beat the others and zero otherwise. In the Lottery treatment, one in four participants randomly received 16 cents per point while the rest received nothing. Participants in the Competition and Lottery treatments did not receive feedback about their payment at any point during the experiment. Finally, the payment scheme of the Feedback treatment is identical to the Competition treatment but participants received immediate feedback on whether they won or lost at the end of their performance.

The task is an adapted version of the slider task of Gill and Prowse (2011). Participants faced a screen full of slider bars and had to position as many of them as possible on the 50-mark before time ran out (see Figure 1).[1] This task has the advantage that it is easy to implement online and difficult to cheat.

In the second round, all participants played a standard public goods game with three other randomly selected individuals. The participants in the three treatments were informed that these were not the same individuals they had interacted with in the first round. Participants received an allocation of 80 cents and had to decide how much to keep and how much to allocate to the group. Money allocated to the group was doubled and evenly divided amongst the four group members. The amount allocated to the group is our measure for the willingness to cooperate.

Finally, the participants answered a short questionnaire. We asked for gender and age, and elicited risk attitudes through a simple, non-incentivised question: "How do you see yourself: Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?". The answer is on a scale from 0 ("unwilling to take risks") to 10 ("fully prepared to take risk"). Dohmen et al. (2011), using representative survey data from Germany, find that the question predicts both incentivised choices in a lottery task as well as risky behaviour across a number of contexts. On top of the payments for their performance and the public goods game, participants received a 50 cents show-up fee. Participation in the experiment was restricted to individuals living in the United States.

Data

Table 2 describes the data and sample. We have a total of 1700 participants, 934 of whom are male and 766 of whom are female. They are on average 30 years old. The participants were

[1] In this task, it is obvious to the participants whether they have positioned them on the 50-mark or not.

randomly allocated to the four treatments with allocation to the Feedback treatment being twice as likely to ensure a sufficient number of winners.

Our participants correctly positioned an average of 26.2 sliders with men performing significantly better than women (p=0.000; rank-sum test). Contrary to the findings of some past studies on gender differences in cooperation in the public goods game, average allocations are exactly equal for men and women in our sample (p=0.899). But like many past studies, we find that men rate themselves significantly more risk seeking (p=0.000).[2]

A potential worry with online experiments is selective attrition. If many participants drop out after treatment is revealed and their decision to drop out is correlated with their preferences, this could lead to spurious differences between treatments. To avoid a large number of drop-outs, we made it clear to participants that they would only receive their show-up fee if they completed the entire survey. Moreover, the average payment in our experiment was very generous compared to the standards of MTurk and incentives for completing the survey were correspondingly high.

Only 55 participants dropped out of the survey and only 25 of these after treatment was revealed (compared to a sample of 1700). These 25 observations are evenly distributed across the four treatments (p=0.258; Fisher's exact test).[3] Selective attrition is therefore not an important concern for our study.

Results

Figure 2 shows average allocations to the group for each treatment. In each of treatments, allocations are lower on average than in the control group. The non-parametric Kruskal-Wallis test returns p<0.001, showing that allocations differ significantly across treatments. Participants in the Competition treatment, who compete against three other performances, give 46 cents on average compared to 52 cents in the control group (p=0.025; rank-sum test). Participants in the Lottery treatment, who face random payoffs, give 45 cents, which is also significantly less than those in the control treatment (p=0.013). Participants in the Feedback treatment, who receive immediate feedback after competing, give 42 cents on average, which is less than both the control group (p<0.001) and those in the Competition treatment (p=0.084). Focusing on the Feedback treatment,

[2] See Croson and Gneezy (2009) for an overview of gender differences in risk attitudes and social preferences.
[3] Of the 25 dropouts, 5 were allocated to the control treatment, 5 to the competition treatment, 9 to the lottery treatment and 6 to the feedback treatment.

we find that winners give 44 cents while losers give 42 cents. This difference between winners and losers is not significant (p=0.630).

The lower allocations in the treatments lead to substantially lower social surplus compared to the control group (where we define social surplus as the difference between the average public goods game payoff and the guaranteed minimum average of 80 cents that participants would get if nobody contributed anything). The achieved surplus is 11% lower in the Competition treatment and 13% lower in the Lottery treatment compared to the control group. In the Feedback treatment, the difference is 19%. Performance, on the other hand, hardly varies across treatments (p=0.707; see Figure 3), suggesting that the loss in social surplus is not made up for by increased performance.

In Table 3, we pursue these results more formally using OLS regressions with controls for gender, performance and age (column 2) and risk attitudes (column 3). We regress the public goods game contribution on treatment dummies with control participants being the omitted category. The results from the non-parametric tests are confirmed. Participants in all three treatments give significantly less than the control participants and the effects are robust to the inclusion of controls such as gender, performance, age and risk attitudes.[4]

Conditional on the full set of controls, participants in the Competition and Lottery treatments contribute around 12 percent less in the public goods game compared to participants in the control group. This indicates that comparative pay has a detrimental psychological effect on people's willingness to cooperate with others. This effect is present whether the outcome is decided by superior performance or by pure luck. This is interesting because in the workplace context, outcompeting others depends on performance and luck to varying degrees depending on how well the organisation is able to monitor the true performance of its employees.

Strikingly, winners in the Feedback treatment are no more generous, giving 15 percent less compared to the control group. This is interesting for several reasons. First, it shows that the effects of the Competition and Lottery treatments cannot be explained by participants trying to make up for an expected loss. Second, it shows that there is a negative effect of competitive environments even on the winners. Third, it shows that the negative effect of comparative pay persists after the payoff uncertainty has been resolved.

Losers in the Feedback treatment are even less cooperative, contributing 19 percent less compared to control participants and 5 percent less compared to the winners. This is important because many competitions, such as for example the competition for promotions in a company,

[4] The results are qualitatively and quantitatively similar when we use tobit regressions.

create only one winner but many losers. It also shows that when feedback is present, as it usually is in a workplace context, comparative pay has an even stronger negative effect on cooperation.

We explore the significance of the difference between the various treatments in Table 4, which reports p-values from Wald tests for the difference in public goods game contributions between the Feedback treatment and the Competition and Lottery treatments. The tests confirm that, conditional on the full set of controls, participants in the Feedback treatment give significantly less than participants in both the Competition and the Lottery treatments. The difference between the contribution of Feedback losers and the Competition and Lottery treatments is even larger and always significant. However, the difference in contributions between winners and losers is never significant at conventional levels.

Finally, we have a look at gender differences in the effect of comparative pay on the willingness to cooperate. Past research shows that the attitudes towards and reactions to competition vary between men and women, with men generally being more competitive. Figure 4 shows the differences in public good contributions across treatments separately for men and for women. The differences are stronger for men. This is reflected by non-parametric tests: while contributions vary significantly across all treatments for men ($p=0.001$; Kruskal-Wallis test), this is not the case for women ($p=0.217$). Table 5 shows regression results separately by gender. In the male subsample, participants in all treatments give less than the control group while in the female subsample, only the difference between the Feedback treatment losers and the control group is significant.

Conclusion

In this study, we demonstrate that comparative payment schemes have a detrimental effect on the willingness of individuals to cooperate with others even when cooperation does not affect their payoffs. Moreover, our design excludes reciprocity, beliefs and income effects as explanations. We therefore interpret the measured impact of comparative pay on cooperation as a psychological effect which exists over and above the potentially perverse incentive effects of comparative payment schemes.

If our results generalise to a workplace context, they would have important ramifications for the design of optimal organisational structures and incentive schemes. Hierarchical organisational structures are inherently competitive as only a few of those on a given level will manage to move up to the next. If the hierarchical pyramid is steep, employees on all levels find themselves in

constant competition. Likewise, comparative compensation schemes lead to employees constantly being forced to compare themselves with and compete against their co-workers.

Our results indicate that any potential productivity gain engendered by comparative reward schemes comes at the cost of a reduced willingness to cooperate. Which effect dominates will depend on the magnitude of the productivity gain and the importance of cooperation for the aims of the organisation. One can imagine that a company would not be unduly worried about the cooperativeness of e.g. independently operating sales people. But when teamwork and organisation-wide cooperation are crucial for an organisation's goals, competitive incentives and promotion mechanisms could carry a huge cost. In this study we used a simple real-effort task and found that the incentive scheme did not have an effect on performance; future work should explore more complex skill-based tasks where the effect might be different.

If one is willing to extrapolate even further, our results could be relevant for predicting how societies change as they become more competitive. Higher unemployment and lower job security throughout the career mean that arguably the lives of many people in advanced economies have recently become more competitive. Moreover, this already starts during the educational career where outperforming others becomes more and more important for future economic outcomes. Our results indicate that this sort of social change could have a detrimental impact on the cooperativeness of society as a whole.

Finally, our results could be relevant for our understanding of the recent financial crisis, which exposed many examples of extreme selfish behaviour in male-dominated environments where comparative payment schemes and competition are ever-present. Our results suggest that this might not be due purely to a selection effect (competitive environments attracting selfish people) but might be partially explained by an effect of the work-environment on the mind-set of the employees.

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Tables

Table 1: Experimental treatments

	Control	Competition	Lottery	Feedback
Comparison:	Individual	3 randomly selected performances	Random groups of 4	3 randomly selected performances
Payment:	4 cents per point	16 cents per point if beat other performances	Random group member gets 16 cents per point, others get zero	16 cents per point if beat other performances
Feedback:	No	No	No	Yes

Table 2: Data

	Sample:	Men:	Women:
Observations:			
Control	334	173	161
Competition	351	184	167
Lottery	360	208	152
Feedback	655	369	286
Total	1700	934	766
Variable means:			
Performance	26.2	28.7	23.0
PG allocation	45.9	45.9	45.9
Age	30.0	28.3	32.1
Risk seeking	6.6	6.9	6.2

Table 3: OLS regressions (dependent variable: public goods game contribution)

	(1)	(2)	(3)
Competition	-5.748**	-5.725**	-5.156**
	(2.622)	(2.601)	(2.521)
Lottery	-6.602**	-6.274**	-5.239**
	(2.606)	(2.578)	(2.534)
Feedback (winner)	-8.010**	-6.264*	-7.059**
	(3.532)	(3.554)	(3.541)
Feedback (loser)	-10.064***	-11.295***	-10.941***
	(2.363)	(2.354)	(2.301)
Male		1.598	-0.841
		(1.718)	(1.695)
Performance		-0.372***	-0.307***
		(0.082)	(0.081)
Age		-0.107	-0.062
		(0.078)	(0.076)
Risk-seeking			3.083***
			(0.323)
N	1675	1675	1675

Note: Robust standard errors in parentheses; *, ** and *** denote significance at 10, 5 and 1 percent, respectively.

Table 4: Differences in public goods game contributions between treatments (p-values in parentheses)

Competition - Feedback	3.904	4.548	4.998
	(0.086)	(0.047)	(0.023)
Lottery - Feedback	3.050	3.956	4.884
	(0.176)	(0.080)	(0.027)
Competition - Feedback (losers)	4.316	5.570	5.785
	(0.068)	(0.020)	(0.012)
Lottery - Feedback (losers)	3.462	5.021	5.702
	(0.140)	(0.034)	(0.014)
Feedback (winners) - Feedback (losers)	2.055	5.031	3.882
	(0.539)	(0.142)	(0.255)
Gender, performance and age		√	√
Risk attitudes			√

Note: P-values are from Wald tests of differences in public goods game contributions between treatments after regressions corresponding to columns (1) to (3) in Table 3.

Table 5: OLS regressions by gender (dependent variable: public goods game contribution)

	(1) Male:	(2) Female:	(3) Male:	(4) Female:	(5) Male:	(6) Female:
Competition	-9.101**	-2.004	-8.948**	-2.242	-8.354**	-1.684
	(3.680)	(3.729)	(3.644)	(3.713)	(3.549)	(3.588)
Lottery	-8.181**	-5.117	-7.918**	-4.688	-6.977**	-3.548
	(3.551)	(3.842)	(3.516)	(3.778)	(3.496)	(3.655)
Feedback (winner)	-10.482**	-4.965	-9.269**	-1.477	-9.965**	-2.516
	(4.320)	(6.651)	(4.327)	(6.492)	(4.255)	(7.105)
Feedback (loser)	-13.561***	-6.234*	-14.728***	-7.649**	-14.615***	-6.950**
	(3.322)	(3.356)	(3.289)	(3.371)	(3.279)	(3.209)
Performance			-0.308***	-0.493***	-0.263**	-0.390***
			(0.108)	(0.117)	(0.104)	(0.125)
Age			-0.103	-0.131	-0.061	-0.078
			(0.123)	(0.102)	(0.120)	(0.098)
Risk-seeking					2.792***	3.442***
					(0.449)	(0.463)
	-9.101**	-2.004	-8.948**	-2.242	-8.354**	-1.684
N	934	741	934	741	934	741

Note: Robust standard errors in parentheses; *, ** and *** denote significance at 10, 5 and 1 percent, respectively.

Figures

Figure 1: The slider task

Figure 2: Average allocation by treatment

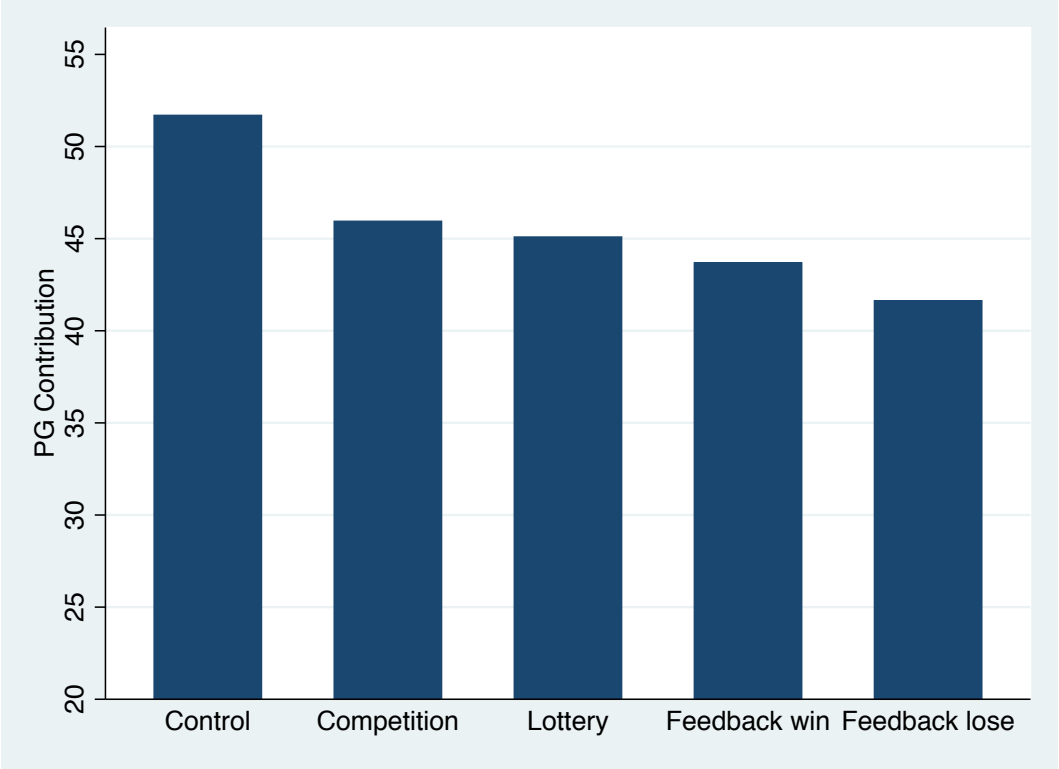

Figure 3: Average performance by treatment

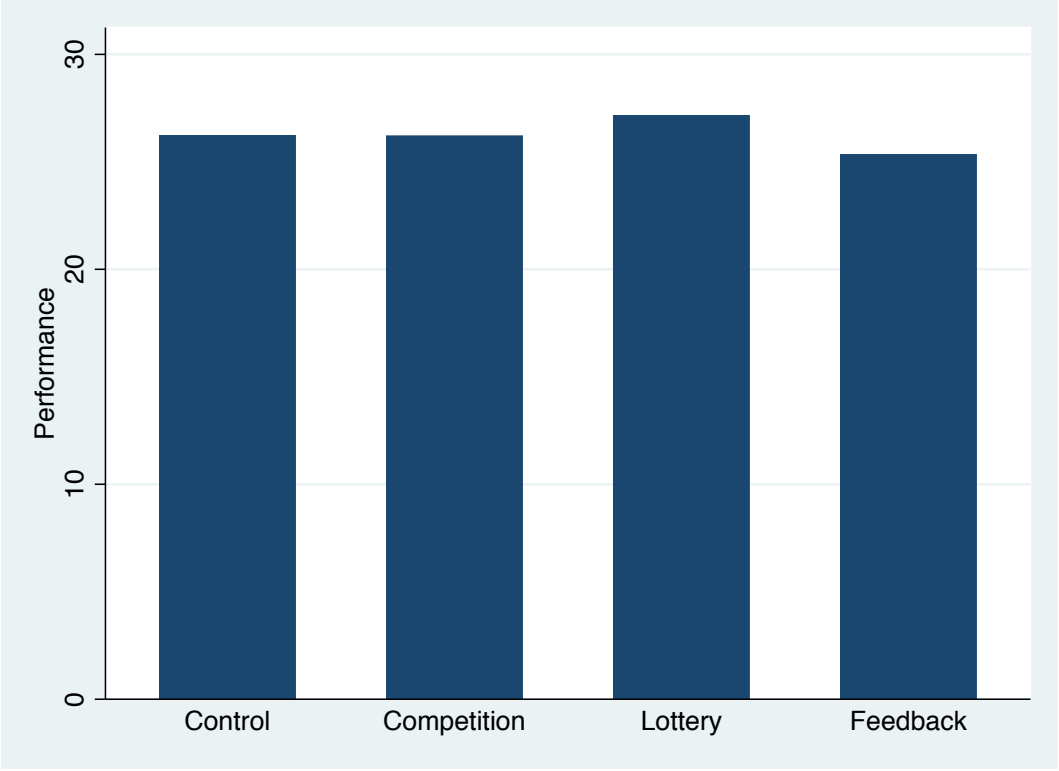

Figure 4: Average allocation by treatment (by gender)