The Impact of (In)Equality of Opportunities on Wealth Distribution: Evidence from Ultimatum Games

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The Impact of (In)Equality of Opportunities on Wealth Distribution: Evidence from Ultimatum Games*

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Abstract

We study the impact on payoff distribution of varying the probability (opportunity) that a player has of becoming the proposer in an ultimatum game (UG). Subjects' assignment to roles within the UG was randomised before the interactions. Subjects played 20 rounds anonymously and with random re-matching at each round. We compare the outcomes of four different settings that differed according to the distribution of opportunities between the pair of players in each round, and across the whole 20 rounds. The results clearly point to the existence of a discontinuity in the origin of the opportunity spectrum. Allowing a player a 1% probability of becoming the proposer brings about significantly lower offers and higher acceptance rates with respect to the benchmark case where a player has no such a chance. As such probability is raised to 20% and 50%, this same trend continues, but the effects are generally no longer significant with respect to the 1% setting. In one case the monotonic pattern is violated. We conclude that subjects in our experiment appear to be motivated mostly by the purely symbolic aspect of opportunity rather than by the actual fairness in the allocation of opportunities.

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" There is a symbolic utility to us of *certainty* itself. The difference between probability .9 and 1.0 is greater than between .8 and .9, though this difference between differences disappears when each is embedded in larger otherwise identical probabilistic gambles– this disappearance marks the difference as symbolic." (Nozick 1995, p. 34).

1 Introduction

The aim of this paper is to investigate the relationship between distribution of opportunities and individuals' preferences over wealth allocation using an experimental approach. The notion of equality of opportunity is one of the cornerstones of systems of distributive justice in contemporary societies. It can be defined as a condition where "the assignment of individuals to places in the social hierarchy is determined by some form of competitive process, and all members of society are eligible to compete on equal terms. [...] The background assumption is that a society contains a hierarchy of more and less desirable, superior and inferior positions (Anderson, 2002)". Various notions of equality of opportunity have been put forward in the political philosophy literature[1], which have stimulated different kinds of economic policies. Affirmative action programs seek to bring about greater fulfillment of formal equality of opportunity by imposing coercive imposition of quotas for social groups that have been discriminated in the past. Governments also devote large amounts of public expenditures to insure primary education[2], and to fight child poverty[3], in large part to improve substantial equality of opportunity.

In spite of the centrality of this notion for contemporary political systems, our knowledge of how individuals' preferences and values react to greater equality of opportunities is extremely scarce. Alesina and La Ferrara (2005)

[1]For instance, Williams (1962) distinguishes between formal and substantial equality of opportunity. Both approaches share the idea that the government should reduce the differences in individuals' unchosen circumstances that affect the access to positions in the social hierarchy - such as those related to one's initial ascriptive social status. They differ as to whether to demand active policies of wealth redistribution to be implemented. Substantial equality of opportunities have in turn generated notions such as "fair" equality of opportunity (Rawls, 1999; 2001), and the "level playing field" conception (Dworkin 2000; Romer, 1998). For other treatments of opportunity, see Diamond (1995), and Sen (1993).

[2]According to UNESCO data, the governmental expenditure for each student amounts to 19% of per capita GDP in the average of OECD countries.

[3]Examples of such policies are George W. Bush's "no-child-left-behind" program (see (http://www.whitehouse.gov/news/reports/no-child-left-behind.htm)), or the commitment to halve the child poverty by the Labor party in the UK.

are one exception when they maintain that preferences for policies of redistribution across US citizens depend on individual beliefs on what determines one's position in the social ladder. In particular, people who believe that the US society offers equal opportunities of 'getting ahead in their life' are more averse to redistribution[4]. This finding suggests that individuals may consider wealth redistribution as a substitute for the lack of real opportunities, and more generally points to the existence of a link between preference over earnings allocation and opportunities.

In our study, we use various settings of an Ultimatum Game (UG henceforth) to investigate the relationship between distribution of opportunities and preferences over earning allocation (Guth *et al.*, 1982). In an UG two individuals participate in a bargaining problem over the division of a pie from an asymmetric position. The proposer of the game has a 'first-mover' advantage over the responder in that she can dictate the shares of the final allocations, whereas the responder only has a veto power on such proposal. This position of advantage is normally conducive to a larger share of the payoffs accruing to proposers, who on average obtain more than 60% of the pie (see e.g. Kagel and Roth, 1995). In this sense, the proposer's position may be thought of as being more desirable than that of the responder. This setting seems therefore to offer a suitable framework to study how opportunities are connected with preferences over payoffs distribution experimentally. The main novelty of our experiments is to make the access to the two positions in the bargaining game subject to a lottery, and to manipulate the distribution of probability of these lotteries across different treatments. We can thus quantify the degree of 'opportunity' for a subject as their probability to become the proposer in the UG, and examine how individual choices respond to variations in such probability distribution. As the literature has already extensively emphasized, inequality aversion and, more generally, preferences over inequality aversion or conformity to social norms of fairness play an important role in determining individual behavior in the UG (e.g. Camerer 2003). In this paper we examine how such preferences are mediated by changes in the initial allocation of 'opportunities'.

More specifically, in our baseline treatment *(0-Opp.)* only one player in the group of two is allowed to make a proposal to the other player. That is, a player has no opportunity of having her proposal being selected, which

[4]This result is robust to controlling for the individual prospects of income class mobility - both in terms of individual perception and an objective estimation elaborated by the authors. The measure used by the authors to assess individual perceptions of equality of opportunities is their answer to the following question from the General Social Survey "Some people say that people get ahead by their own hard work; others say that lucky breaks or help from other people are more important. Which do you think is most important?"

represents the setting with the most extreme assignment of 'opportunities'. In all the other three treatments we consider, both players in a group have some positive probabilities of becoming the proposer of the group. These probabilities are known ex ante by both players, when they are required to make a proposal. We name the three treatments that modify the baseline case according to the probability of becoming the proposer assigned to the less favored subject in the group. These probabilities are 50%, 20%, and 1%, which then correspond to settings with the presence of equal 'opportunities' *(Eq. Opp.)*, moderate inequality of 'opportunities' *(20%-Opp.)*, and symbolic 'opportunity' *(1%-Opp.).* The last setting should in principle be only marginally different to the *0-Opp* case in terms, the fundamental difference being that the less favored individual is in fact allowed to make a proposal, although the chances of this proposal being selected are extremely small. We repeat the game for 20 rounds, with random re-matching at the beginning of each round. We also vary the *intertemporal* allocation of opportunities across the 20 rounds. In our first study an individual always carries the same probability in each round of becoming the proposer in the group (we call this study fixed role condition (FRC)). In the second study, the probabilities are reassigned before each round (we refer to this as variable role condition (VRC)). Therefore, in the FRC the intertemporal allocation of opportunities is extremely *biased,* whereas in the VRC it is perfectly *unbiased.* This enables us to investigate how variations in intertemporal allocation of opportunities influence individual behavior.

We want to test for the following two hypotheses: (i) Opportunity has a symbolic value (or utility) to the subjects. In particular, the setting with a merely symbolic opportunity *(1%-Opp)* may be considered as creating a 'playing field' more 'level' than the setting with no opportunity. This may induce responders to be more lenient in accepting proposals, *ceteris paribus*, and thus allow proposers to demand more for themselves. If (i) focuses on the 'origin' of the opportunity spectrum, (ii) generalizes this conjecture to the whole of the spectrum. In (ii) we claim that as the fairness in the allocation of opportunities increases, so do proposers' demands, and, *ceteris paribus*, responders' probability of acceptance. We test for this hypothesis firstly comparing patterns of behavior across the *1%-Opp*, *20%-Opp*, and *Eq-Opp*, where opportunities *within each round* become progressively more equally distributed. Secondly, we also test for this hypothesis comparing the FRC and the VRC, where the intertemporal allocation of opportunities is biased in the former case and unbiased in the latter. We do this because subjects' behavior may be affected not just by the possible unfairness in the single round of interaction, but also by the perceived unfairness of the *whole* 20 rounds of interactions. (i) has not been addressed in the empirical literature before. One theoretical antecendent is Nozick's (1991) theory of *symbolic* *utility*, such that some actions could have an intrinsic value for individuals to the extent that they symbolize a principle[5]. On the basis of this idea, it may be argued that the possibility for an individual to put forward a proposal in the *1%-Opp.* setting may have an intrinsic value for her that goes beyond the negligibility of her chances to have that proposal actually selected. (ii) is consistent with Alesina and La Ferrara's (2005) result. The test of this hypothesis within an experimental setting enables us to check explicitly how individual preferences over wealth distribution reacts to manipulations in the inequality of opportunity.

Our main results are: i) The settings assigning 1% probability and 0 probability to the non-favored person are indeed significantly different from each other. Favored proposers in the *1%-Opp* setting demand significantly more for themselves compared to favored proposers in the *0-Opp* setting. Likewise, responders reject offers with a significantly higher probability, *all things being equal*, in the *0-Opp* compared to the *1%-Opp.* Furthermore, hypothesis i) holds in both VRC and FRC, thus showing its resilience to variations of the context. ii) Increasing such probability to 20% and 50% brings about behavior generally consistent with a monotonically increasing pattern, but no significant difference with respect to the 1% setting emerges. In one case in the VRC the 'monotonic' trend halts at the *20%* opportunity level and is reversed moving to the 50% level. Moreover, comparing the results of the FRC treatment with the VRC treatment, we observe that the introduction of intertemporal equality of opportunity to become a proposer in the VRC brings about a significant increase in both favored proposers' demands, and non-favored responders' probability of acceptance if compared to the FRC treatment. In section 4.4 we conjecture that the reversal in the monotonicity pattern observed in the VRC may be due to subjects attributing a role of 'focal point' to the outcome of the lottery, which is possible in a context of intertemporal equality of opportunity, but not in a context of intertemporal inequality of opportunity. Overall, these results suggest that the symbolic aspect of opportunity seems to account for most of the variation in individual behavior across changes in settings.

The analysis on how the presence of opportunity affect individuals' allocation preferences has received little attention in the empirical economic literature. The only experimental study we are aware of that addresses a related issue is Bolton et Al. (2005, BBO henceforth)[6], who investigate within UGs whether the allocation bias of a random fair procedure influences the *ex*

[5] Along symilar line see Anderson and Pildes (2000): 1503- 75; and Cass Sunstein (1996): 2021-53.

[6] Harrison and Mccabe (1996) also employ a similar setting to ours with random role assignment. However, they only use an unbiased randomization (that is our 50 percent setting), and their purpose of using it is completely different from ours.

post acceptability of the outcome of the procedure. Their main result is that responders seem to treat equivalently settings with fair procedures leading to unequal outcomes, and settings with equal outcomes. That is, procedural fairness - even when leading to unequal outcomes - is under some conditions a 'substitute' for outcome equality. However, while BBO study fairness in direct relation to the final outcome of the interaction, we analyze fairness over the allocation of initial 'opportunities' - that is, prior to the unfolding of the interaction. Furthermore, in our setting we were able to define an exact and measurable concept of opportunity, which, as we saw above, can also be parametrized and changed in order to analyze its impact on the final outcomes in terms of wealth allocation. Hoffmann *et al.* (2000) study how framing an UG as a 'personal' exchange rather than an 'impersonal' one triggers more equality-oriented behavior in the players. Their manipulation derives from a change in instructions rather than a change in the structure of the interaction, as in our case.

The rest of the paper is organized as follows. We illustrate the experimental protocol and the main hypothesis in the next section. In section 3 we show the results under the FRC, in section 4, we show the result from the VRC and compare this results with the ones obtained with the FRC. In section 5 we check the robustness of the above result, section 6 is devoted to the discussion of a post hoc theory able to explain our findings. Section 7 concludes the paper. The experimental protocol is at the end of the paper.

2 The experimental framework

2.1 The stage game

The game tree of the stage game is displayed in Figure 1.

INSERT FIGURE 1 HERE

10 GBP are at stake in every round. In settings with positive probabilities assigned to both players - i.e. *1%-Opp, 20%-Opp,* and *Eq-Opp* - both players simultaneously make a proposal, which is a division of the total pie, to their counterpart. Formally, a proposal is a division $(x_i, 10 - x_i)$ where x_i is the amount player i, $i \in \{1, 2\}$ wants to keep for herself and $10 - x_i$ is offered to her counterpart. For brevity of notation, we will identify an offer by the amount x_i and simply call it a 'proposal'. One of these two proposals are selected at random with probability q and $1 - q$ respectively. At the time of making a proposal, subjects know the probability with which this will be randomly selected. The rest of the interaction is exactly like in the

standard UG. Once a proposal has been selected, it is communicated to the counterpart of the person who has made that proposal. The proposer is informed at this stage that her offer has been selected, but she does not receive any information about the offer which was not selected. As usual the responder of the selected offer makes a decision as to whether to accept or to reject the division. If she accepts, then the proposed division is implemented otherwise both receive 0. In the baseline setting - i.e. the *0-Opp* setting - only one player in the group is allowed to make a proposal to the other player. Therefore, only the left-hand side of the tree in Figure 1 is relevant for this case.

We ran four different treatments of this stage game, which differ according to the values assigned to the probability q. As mentioned in the Introduction, the case called '*Eq-Opp*'[7] is the one where both subjects' proposals have equal probabilities of being selected, that is $q = 0.5$. The other three treatments assign unequal 'opportunities' to the two players of having their proposals selected. We call the subject who had a larger (smaller) opportunity the *'favored'* (*'non-favored'*) player. In the '*20%-Opp*' setting, the lottery assigns $q = 0.2$ to the 'non-favored' player, and $1 - q = 80\%$ to the 'favored' player. In the '*1%-Opp*' setting, the non-favored player has instead a $q = 0.01$ opportunity for her proposal to be selected (and the other player obviously has a $1 - q = 0.99$ probability). This captures the limiting situation to the '*0-Opp*', where the non-favored player has a probability $q = 0$ of becoming the proposer in the group. The use of several opportunity levels aims at studying the variation in individual behaviour upon changes in the opportunity allocation. Note that from the rational agent theory perspective all these games are strategy equivalent, and should lead to the proposer obtaining the highest possible allocation consistent with making the responder willing to accept and the responder obtaining the residual. That is, the only subgame perfect equilibrium is $(10-\varepsilon, \varepsilon)$[8], and the level of q should not affect this result. The *0-Opp, 1%-Opp, 20%-Opp* settings were replicated in the FRC and the VRC, so that overall we had a total of seven treatments.

Subjects played the game described above anonymously for 20 rounds with random re-matching at the beginning of each round. Therefore, although the probability that the same pair would interact in more than one period was in general substantial, the random re-matching and the anonymity of the play minimized the incentives to create reputation effects. In order to reduce even further these incentives, payoffs were assigned on the basis of the outcomes of just *two* rounds out of the 20,which were randomly selected

[7] All the terms are only for the exposure of this paper and have obviously never been revealed to the subjects.

[8] Since players were allowed to make offers over the $[0, 10]$ interval up to the second decimal digit, $\varepsilon = 0.01$ in our experiments.

at the end of the session. This payment rule entailed that there was only a 10% chance that a particular future round would actually determine the player's final payoff. In this way, a player had to multiply the probability to encounter in a future round the player with whom she was currently matched by 10%, if she wanted to determine the actual influence of her action in the current round over the final payoff she would receive. Therefore, given a certain probability z of being re-matched with the same player in the future, the probability that the current action would have some influence over the final payoff was in fact $z/10$.

At the beginning of a session, all the procedures were explained to the subjects and it was emphasized that every round was independent from the others. After each round of interaction, each pair was informed of the outcome of their interaction. No information about the outcome of the other pairs' interactions was instead released. It is clear that the feedback at the end of each round introduced the possibility that players' choices were subject to path-dependence and history contagion effects. However, we preferred this dynamic setting to a uni-periodal one to examine whether *learning* (over the rules of the games) or *experience* (over other players' strategies) effects may affect players' strategies in comparison to the first period. We also believe that the procedures adopted to minimize the incentives for reputation effects make players' choices independent from each other to the maximum possible degree. In the next sections we shall therefore present the results of our econometric analysis for the whole 20 rounds (sections 3 and 4) as well as for the first round (section 5).

What do the benchmark social utility models predict about the hypotheses specified in section 1? All of these models are silent as to the importance of a procedure as such. Distribution based social utility model will suggest that the acceptance or rejection of a proposal depends on the inequality of the proposed division. But then this decision should be independent of how that division was arrived at. That is, irrespective of the value of q, responders should reject and accept similarly across procedures. Therefore, contrary to our hypothesis, we should observe no change in x as we increase q. Note that risk preferences and out of equilibrium beliefs do not play any role here because even with social preferences, all of our settings are strategy equivalent[9].

In both the FRC and the VRC, we test for the two main hypotheses of our paper. Our first hypothesis is that the very fact of being endowed with even symbolic opportunities should influence the outcomes. If it does, that would mean responders will accept a higher level of inequality, which would

[9]Note that due to strategic equivalence, menu dependence (Bolton et al, 2005) is not an issue here.

lead to a higher average proposal. Formally, we want to check whether the average x is significantly different between the *0-Opp* and the other settings, the *1%-Opp* in particular. Notice the following features of our settings which enable us to test for this hypothesis. First, from any theoretical perspective, *0%-Opp* is nothing but the limit of other settings. However, structurally, it is different from the others, because here the non-favored person never gets an opportunity to put forward her proposal. On the contrary, in all other settings she does get such an opportunity, however small the probability of selection might be. We will discuss in section 6 why this symmetry in the actions of the two players can affect the final outcome.

Our second hypothesis says that higher opportunities to the non-favored player will lead to higher inequality in outcome. That is, as the procedure become relatively more unbiased and hence more procedurally fair, the responder will accept more unequal divisions. This will also be reflected in the proposals, because anticipating this behavior in response, subjects, on average, will increase their proposal. In other words, the fairer the procedure, the higher the inequality in outcomes. Formally, an increase in the value of q will increase x_i. We can test for this hypothesis both within a static setting and dynamically. The latter is made possible by comparing allocations emerging in the VRC - where each player has a 50% of becoming the favored player in each round of the biased opportunity settings - with those resulting in the FRC - where instead this probability is 0 for the group of non-favored players.

2.2 General features of the experimental protocol

Procedures for all the games in both FRC and VRC were the same except for the probability of selection q. The experiment instructions for one setting appear at the end of the paper. Experiments have been conducted on a population of 426 Warwick University undergraduate students, with an average of 60 students per treatment. Only subjects who had not been attending courses in Game Theory were allowed to participate. We run three sessions per treatment. Due to varying show-up rates, the number of subjects per session was not constant across sessions but varied from a minimum of 16 to a maximum of 24 subjects, with an average of around 20 subjects per session[10]. The analysis we present in the next sections is however robust to controlling for the number of subjects participating in each session. Each subject only participated in one session. We took care in balancing the composition of the sessions in terms of gender and number of people enrolled in Economics and Psychology courses with respect to the total. Each session

[10]More precisely, the number of subjects per session was as follows:

was organised according to the following procedures. Subjects were paid a show-up fee of GBP5 upon their entering the experimental room, and were assigned to a computer following the random draw of a card. Instructions were then administered, a written comprehension check was carried out, and then subjects were involved in the 20 interactions of our protocol. All subjects answered the comprehension quizzes exactly. At the end of the decisions subjects completed a short questionnaire asking demographic questions, and then received their payoffs. The whole session lasted around an hour. The average earnings - in addition to the show-up fee - was GBP8.22 . The game was conducted using the z-tree software (Fischbacher, 1999).

3 Results for the Fixed Role Condition

In the FRC, at the beginning of each session subjects were randomly divided into two groups, favored and non-favored, except for the *Eq-Opp* where obviously no subject may be considered as 'favored' because both players in the group had the same probability of becoming proposers in the interaction[11]. The main results are as follows.

- In settings where positive probabilities are attributed to the non-favored person's proposal (that is *1%-Opp*, *20%-Opp* and *Eq-Opp*) , favored proposers demanded significantly more for themselves compared to the *0%-Opp* setting. In particular proposals under the *1%-Opp* setting is significantly higher than that under the *0%-Opp* setting. Similarly, average rejected proposals is higher under the *0%-Opp* setting compared to all others. Therefore, all things being equal, the probability of acceptance of a proposal is higher in those setting than in the *0%-Opp* setting.

- As q increases from 1% to higher levels (that is to 20% and 50%), so do the favored players' demands and the probability of acceptance. However, these changes are never significant for proposals, and are only significant in one case for acceptance rates (everything else being equal), in the *Eq-Opp* setting compared to the *1%-Opp*.

Number of subjects per session	*Number of sessions*
16	2
18	2
20	9
22	7
24	1

[11] To simplify terminology we call both roles as favoured in *Eq-Opp* setting.

3.1 Proposers Behavior in the FRC

We begin with the analysis of proposers' behavior. For sake of comparability, in the analysis that follows we only consider the proposals made by those subjects who were favored in the random procedure. That is, in the *1%-Opp* and the *20%-Opp* we discard all those observations made by subjects who had a 1% and a 20% chance of their proposals being selected for approval by the responder, respectively. The reason is that, particularly in the 1% setting, players had extremely little incentives to do strategically reasonable offers, given the small probability they had of being selected as proposers. The results of the analysis would nevertheless be unchanged qualitatively should these observations be included. Descriptive statistics for proposal under each setting are presented in Table 1, from where we can observe monotonic increase in the average proposal.

Table 1: Descriptive Statistics for Proposals - FRC - All rounds

Proposal	0%-Opp	1%-Opp	20%-Opp	Eq-Opp
Mean	6.28	6.77	6.89	6.96
St. dev.	0.91	0.88	0.82	1.05
Min	0.5	4	4.5	2.5
Max	10	9.9	9	9.75
N	620	640	620	1240

Figure 2 plots the evolution over rounds of mean proposals from favored proposers under the FRC. The differences in proposal between *0%-Opp* and the rest can be clearly seen from this graph. The existence of a trend for some of the settings may also be detected.

INSERT FIGURE 2 HERE

To make pairwise comparisons between settings, we employ a regression pooling all proposals from favored players, using dummy variables to identify observations coming from different settings. In particular, we pool observations coming from both FRC and VRC[12]. We consider the following random effects model:

[12] The results of the analysis would not change running separate regressions for the FRC and VRC. Pooling the observations from the two conditions also enables us to run tests over differences between them within the same model, which will be presented in section 4.4. More generally, the results we present are also robust to introducing session dummies, which is an even stronger of control than introducing dummies for the number of subjects per session (see section 2.2).

$$PROPOSAL_{i,t} = \alpha + \beta_t ROUND_t + \delta j SETTING_j + \varepsilon_i + u_{i,t} \quad (1)$$

The index j denotes the observations coming from a certain setting j out of the four settings that we have investigated in the FRC. The sub-indexes i and t denote the individual and the round of the interaction, respectively. Hence, $t = 1 \dots 20$. The model includes dummy variables, $ROUND_t$, for each of the 20 rounds the games were played. $SETTING_j$ is a dummy variable that identifies observations coming from setting j. The parameters δj therefore signal whether significant differences exist in proposals under setting j in comparison with the baseline setting. Finally, ε_i is an individual-specific error term, whereas $u_{i,t}$ is the error term referring to each observation. Standard errors are robust to heteroschedacity and clustered across individuals (Froot, 1989). Clustering makes it possible to treat errors as both independent across decisions from different individuals, and arbitrarily correlated for decisions made by the same individual. In this section we only focus on differences between settings, whereas we comment over results regarding the existence of trends in section 5. The overall results of the regression are reported in Table 14, column 1, in 8.

The following table reports in each cell the results concerning various tests conducted on the differences between pairs of parameters δj and δ_k. We report the z-statistics and the level of rejection for the null hypothesis of equality of the coefficients. So, the content of a cell $(j;k)$ refers to the result of the test with null hypothesis Ho: $\delta j - \delta k = 0$. Note that a positive (negative) sign for the z-statistics means that the proposals were on average higher (lower) in setting j (row entry) in relation to setting k (column entry). For instance, the cell corresponding to the row *1%-Opp* and column *0%-Opp* setting reports the z-statistics for the dummy variable identifying the *1%-Opp* setting in the pooled regression over observations from the *1%-Opp* and the *0%-Opp* settings. The value of 2.86 for such z-statistics implies that this variable is strongly significant at less than the 1% level, and that proposals were on average significantly higher in the *1%-Opp* setting in comparison with the *0%-Opp* setting. In the following tables and in all the tables afterwards, acceptance at 10%, 5% and 1% significance level are denoted by one, two and three stars respectively.

Table 2: Difference in Proposals - FRC - All Rounds

	0%-Opp	1%-Opp	20%-Opp	Eq-Opp
0%-Opp				
1%-Opp	2.86***			
20%-Opp	3.52***	0.72		
Eq-Opp	4.30***	1.24	0.44	

One can see that while comparing *0%-Opp* with each of the other three settings, the coefficients of the dummy variables identifying each setting is significant at the 1% level in all three cases. However, the coefficients for the dummy variables – although they have the expected sign– are statistically indistinguishable (at 10% confidence level) from each other in the remaining three pairs, which attribute positive opportunities to the non-favored role.

3.2 Responders Behavior in the FRC

Descriptive statistics are reported below for rejected offers - namely, the share offered to a responder conditional on the proposal having been rejected - and the overall frequency of acceptance under the various settings. Analogously to the analysis of proposers' behavior, we only focus on responses of non-favored players. In this case, the behavior of favored players who lost the lottery to select proposal may be affected by the fact that their payoff expectancy was higher than that of non-favored players. We thus prefer to eschew these observations from the analysis. The results would not change substantially considering both favored and non-favored players' responses. In Table 3, we note that increases in opportunity are associated with quite substantial drops in the mean rejected offer.[13]

Table 3: Unfavoured responder's behaviour in FRC - All Rounds

Rejected offer	0%-Opp	1%-Opp	20%-Opp	Eq-Opp
Mean	2.96	2.53	2.52	2.15
Min	0	0.1	1	0.25
Max	4.5	4	4.2	4
Average Acceptance	0.776	0.788	0.844	0.815
Total Offers	620	636	473	620

This pattern is also evident in Figure 3, showing rejection and acceptance rate of proposals which offer less than 20% of the pie to responders. The existence of a monotonic pattern, both in the *number* of 'unfair' offers and in the probability of acceptance, is quite evident.

INSERT HERE FIGURE 3

[13] Note that the number of offers to non-favoured players may differ from those made by favoured players in the *1%-Opp* and in the *20%-Opp* settings because of the outcomes of the randomization procedure.

The above descriptive statistics obviously do not control for the size of the offer, which we have noted is quite variable across settings. Econometric analysis enables us to study the probability of acceptance holding this variable constant. We thus use the dichotomic variable acceptance (ACC) - where 1 (0) denotes acceptance (rejection) of a given proposal - as the dependent variable within a logistic model:

$$ACC_{i,t} = \alpha + \beta_t ROUND_t + \delta j SETTING_j + \eta OFFER + \varepsilon_i + u_{i,t} \quad (2)$$

The econometric specification is analogous to that deployed to analyze proposals, with the key addition of the variable $OFFER$ controlling for the amount offered to the responder. Even in this case $SETTING$ is the dummy variable identifying the settings of the experiments, and $ROUND$ dummies are included. Finally, like in equation 1, ε_i and $u_{i,t}$ are individual-specific and observation-specific error terms. The complete regression results are reported in Table 15, column 1, in section 8.

A comparison between Table 4, which captures the significance of $SETTING$ on pairwise comparisons of acceptance, and Table 2 - which is the corresponding table for proposals - shows that the former somehow mirrors the latter in terms of significant effects of the setting dummies. Generally speaking, a significantly higher value for $PROPOSAL$ in a setting j vis-à-vis setting k is matched with a higher probability of acceptance in the former vis-à-vis the latter. One can see that settings assigning non-favored players a positive chance of having their proposals being selected are associated with a higher probability of acceptance of a proposal, all things being equal, in comparison with the *0%-Opp* settings. However, some relevant differences emerge - unlike the case of proposal, we find that acceptance level is significantly higher in *Eq-Opp* than in the *1%-Opp*, while the difference between 1%-Opp and 20%-Opp has the expected sign according to hypothesis (ii), but it is not significant at the 10% level.

Table 4: Difference in Acceptance Rates - FRC-All Rounds

Acceptance	0%-Opp	1%-Opp	20%-Opp	Eq-Opp
0%-Opp				
1%-Opp	2.61***			
20%-Opp	3.83***	1.34		
Eq-Opp	5.16***	2.65***	1.18	

To summarize our main findings, there is clear evidence that fairer assignments of opportunities can sustain or even lead to a higher inequality in outcomes. However, most of this changes seem to be absorbed by discontinuity in behavior associated with the assignments of minimal opportunities to the non-favored player in comparison to the no opportunity case, rather than by substantially fairer allocations of opportunities.

4 The Variable Role Condition

4.1 General Features

The interactions under the VRC are identical to those under the FRC, the only difference lying in the formation of random pairings. In contrast to the FRC, here the status of a subject (favored or non-favored) is decided randomly (with equal probability) at the beginning of every round. Thus at each round all the subjects have an ex ante equal chance of getting a favored (or non-favored) role.[14] Only when the random pairings have been made, subjects are informed of their respective roles. Once again, a non-favored subject in *0%-Opp* VRC is not asked to make an offer. However, unlike the FRC case this is not a restriction for the entire session, because in following rounds the same person can be randomly selected to play a favored role. To make proper comparisons, we replicate all FRC settings in variable role except for *Eq-Opp*, which would be the same anyway under both conditions.

The main purpose of this condition is to control for the impact of intertemporal allocation of opportunities. Furthermore, this study also represents a robustness check for the result obtained under the FRC since we introduce the possibility of role reversals, which might have influenced our results in the FRC. It is well possible that experiencing the perspectives of all possible roles, involved in a game, enhance subjects understanding of its strategic aspects. Recall that except for *0%-Opp*, in all other FRC settings both subjects got a chance of making an offer. Moreover, in FRC, to begin with, subjects were divided into favored and non-favored groups. So once a subject was in a non-favored (or favored) group, she remained in that group for the entire session. Therefore a subject, who was in the non-favored group in *0%-Opp* setting never got a chance to make an offer, unlike the rest. Did the absence of such possibility restricted their understanding of strategic interactions? Could this have influenced our result rather than the intrinsic fairness aspect of participation?[15]

The main observations are in line with those from the FRC. Following is

[14] So for instance, in *0%-Opp* setting, in each pair, one of the players is selected at random with probability $\frac{1}{2}$ and asked to make an offer. Similarly, say in *20%-Opp*, one of the partners is selected with probability $\frac{1}{2}$ to play the favored role.

[15] Bolton (1991) showed that there is no effect of role reversal on UG.

a summary of our findings. Therefore comparisons here will involve, *Eq-Opp* and the variable role versions of the other three settings (*0%-Opp*, *1%-Opp* and *20%-Opp*).

- As in FRC, proposals under the *0%-Opp* is significantly lower than the other three settings, which offer positive probability of selection to the non-favored person. Differences in acceptance rates are also significant. However the evidence here is not always as strong as that in the FRC. For a couple of comparisons, our hypothesis is accepted only at the 10% level (as opposed to the 1% level in FRC) of significance.

- The effect of increasing opportunity beyond the *0%-Opp* setting is not monotonic. In fact there are evidence that, other things being equal, probability of acceptance of a proposal is lower in *Eq-Opp* compared to *20%-Opp* and *1%-Opp* setting. This stands against the thesis that increases in procedural fairness – seen here as increases in equality of opportunity - should lead to higher acceptance rates (see BBO, 2005).

4.2 Proposers Behavior in the VRC

Descriptive statistics for proposals under each setting of the VRC are reported in Table 5. The data related to the *Eq-Opp* obviously coincide with those summarized in Table 3, and have been reported for the reader's convenience.

Table 5: Descriptive Statistics for Proposals -VRC-All Rounds

Proposal	0%-Opp	1%-Opp	20%-Opp	Eq-Opp
Mean	6.56	7.20	7.37	6.96
St. dev.	1.07	0.90	0.98	1.05
Min	0	5	5	2.5
Max	10	10	10	9.75
N	600	560	600	620

Figure 4 plots the evolution over rounds of mean proposals from favored proposers under the VRC. Clearly there is an upward trend in average proposals, in particular in the *0%-Opp* setting.

INSERT FUGURE 4 HERE

Our hypothesis of intrinsic importance of symbolic opportunity still holds strongly under the VRC. The same econometric analysis as that developed for the FRC (see Table 14, column 1) shows that proposals in the *0%-Opp* are significantly lower than all of the other three settings (at the 1% level). Thus, proposed divisions are clearly more unequal under any setting offering positive probability of selection to the non-favored person's proposal. This is shown in Table 6, which reports in each cell the z-statistics and the significance levels for differences in the δ parameters for proposals. Moreover, the only comparison where some significant difference emerges among the settings assigning positive opportunities to the non-favored player is between the *20%-Opp* and the *Eq-Opp* settings. However, the sign in this case is opposite to what one may have expected. Favored proposers under the *20%-Opp* demand significantly more than in the *Eq-Opp* setting. This result reverses the monotonicity path that would link increases in opportunity for non-favored individuals to higher shares for favored proposers. In fact, even the proposals in the *1%-Opp* setting are higher than in the *Eq-Opp* setting, although the coefficients are not significantly different.

Table 6: Differences in Proposals - VRC-All Rounds

	0%-Opp	1%-Opp	20%-Opp	Eq-Opp
0%-Opp				
1%-Opp	4.36***			
20%-Opp	5.57***	1.27		
Eq-Opp	2.90***	−1.54	−2.82***	

4.3 Responders Behavior in the VRC

Table 7 reports the descriptive statistics for responders behavior in the VRC. Even in this case, the drop in the mean rejected offer as opportunity increases is quite noticeable. However, this monotonic path is reversed in correspondence of the *Eq-Opp* rule, which has a higher mean value for rejected offers than both the *1%-Opp* and the *20%-Opp* settings. In fact, the conflictuality rate is the highest in the *Eq-Opp* setting in comparison to all of the others, and this is in fact lowest in the *0%-Opp* setting, followed closely by the *20%-Opp* setting.

Table 7: Non-favoured responder's behaviour in VRC

Rejected offer	0%-Opp	1%-Opp	20%-Opp	Eq-Opp
Mean	2.43	2.06	1.68	2.15
St. dev.	0.91	0.78	0.72	0.849
Min	0	0	0	0.25
Max	4	3.6	3.5	4
Average Acceptance	0.850	0.816	0.848	0.815
Total Offers	600	553	475	620

We obviously need to control for the size of the offer to make sense of these results. We thus study differences in settings using the same econometric model given in section 2. Even in this case, the results for proposers are mirrored by those for responders. We find that acceptance rates are higher under all settings assigning positive opportunities to the non-favored player compared to the *0%-Opp.* However, the effect of the $SETTING$ dummy variables in pairwise comparisons is sometimes only weakly significant, for instance at the 5% level while comparing with *1%-Opp* and at 10% level while comparing with the *20%-Opp.*

Table 8: Differences in Acceptance Rates -VRC-All Rounds

	0%-Opp	1%-Opp	20%-Opp	Eq-Opp
0%-Opp				
1%-Opp	2.07**			
20%-Opp	3.96***	2.08**		
Eq-Opp	1.78*	-0.36	-2.46**	

VRC settings show that the confirmation of our second hypothesis, which predicts higher acceptance rates in outcomes with an increase in opportunity, does not always carry over from FRC to VRC. Likewise, the *Eq-Opp* setting leads to lower acceptance rates than either the *1%-Opp* and the *20%-Opp,* the difference being significant in the latter comparison at the 5% level. Note that this goes against our findings in FRC. There we found some evidence in favour of monotonicity - in particular we noticed that the acceptability of biased outcome increases with an increase in opportunity. It is plausible that in the VRC, the effect of inequality in opportunity has been offset by the presence of inter-temporal fairness.

We believe this is due to the combination of the features of equality of inter-temporal opportunities in the VRC and the asymmetric character of the random procedure. In spite of the random matching procedures and the random payoff determination making decisions independent from each other, our conjecture is that subjects exploited the asymmetry of the random selection procedure of proposal as a focal point supporting a "norm" attributing a larger share of the pie to a favoured subject. Given the inter-temporally fair character of this procedure, responders were happy to accept a relatively more unequal distribution (in comparison to other settings) on the basis that they would have benefited from the same norm in the future when put in the proposers' role. This conjecture is confirmed by the fact that there exists a statistically significant difference - although weakly - in proposals between favoured and non-favoured players in the '20%-Opp' VRC setting[16], with

[16] A Mann-Whitney test conducted on the equality of proposal distribution between the favored and non-favored groups yields a z = 1.884, with p-value = 0.0596.

non-favored players demanding *less* than favored players. Further analysis is nevertheless needed in support of this conjecture.

To summarize, it is abundantly clear that opportunity, *per se*, plays a very crucial role in determining the perception of fairness. However, inequality of opportunity seems to have little effect on this, particularly in the presence of inter-temporally unbiased procedures. Moreover fair procedures, in the sense described above, are relatively more outcome unequal than unfair procedures.

4.4 Comparing fixed and variable roles conditions

Finally, we compare each of our settings across FRC and VRC. As we already argued there are two layers of opportunity involved in the VRC. First, as in the FRC, each stage game offers an opportunity for a particular period - this we will call as 'static opportunity'. So for instance the *20%-Opp* setting offers unequal static opportunity level to the subjects. However, in VRC, roles are selected at random at the beginning of every period - so all subjects have equal ex ante probability of being selected as a proposer. To distinguish it from the ex-post probability of selection, we call this as 'inter-temporal opportunity'. Notice that all VRC settings offer equal inter-temporal opportunity to subjects, while FRC settings are entirely unequal in terms of inter-temporal opportunity.

The following tables, Table 9 and Table 10, report in each cell the z-statistics and the significance level for differences in the δ parameters estimated in regressions drawn from 1 and 2. For instance, in Table 9, the cell corresponding to the row *Variable 0%-Opp* and column *Fixed 0%-Opp* setting reports the z-statistics for the difference in the dummy variable coefficients identifying the *0%-Opp* under VRC and FRC. The value of 3.45 for such z-statistics implies that this the difference is strongly significant, and that (everything else being equal) acceptances were on average significantly higher in the *VRC 0%-Opp* setting in comparison with the *FRC 0%-Opp* setting.

We find that proposals are generally lower under the FRC vis-a-vis the VRC. In particular, this is the case at the 10% significance level when comparing the *0%-Opp* settings and at 1% level when contrasting both the *1%-Opp* and the *20%-Opp* settings. A possible explanation is that since the FRC entails an unfair assignment of inter-temporal opportunities, favored subjects expect non-favored subjects to be less lenient in accepting low offers under the FRC compared to VRC, and thus reduce their demands significantly. Probability of acceptance are also significantly lower in the FRC in comparison to the corresponding setting in the VRC at the 1% significance level. In fact, this is true for all of our settings individually. It is clear that subjects attached importance not just to the static aspect of the inequality of opportunity, but also to the inter-temporal one. This may be explained both in terms of an attempt to ensure themselves a higher payoff but also as a spiteful reaction to the lack of inter-temporal fairness of this condition[17].

Table 9: Differences in Proposals across VRC and FRC

Proposal	Fixed 0%-Opp	Fixed 1%-Opp	Fixed 20%-Opp
Variable 0%-Opp	1.67*		
Variable 1%-Opp		2.63***	
Variable 20%-Opp			2.96***

Table 10: Differences in Acceptances across VRC and FRC

Acceptance	Fixed 0%-Opp	Fixed 1%-Opp	Fixed 20%-Opp
Variable 0%-Opp	3.45***		
Variable 1%-Opp		2.91***	
Variable 20%-Opp			3.30***

5 Other Results

5.1 Results for First Round

The random effects model used above is a widespread method to analyze repeated interactions in experimental economics, at least as a general way of examining the existence of some kind of relationships across variables. However, it is plausible that subjects to some extent adapted their strategies to the feedback received at the end of each interaction. In particular, it is presumable that proposers updated their beliefs over responders' minimum acceptable offer on the basis of their past experience, and modified their demands accordingly. If this is true, the assumption of a constant auto-correlation parameter across time for each individual is infringed.

In the present section, we check for the robustness of our previous analysis with respect to these problems by analyzing subjects' behaviour in the

[17]It also has to be taken into account that the division of player into two groups in the FRC implied that the probability of being re-matched with the same players in future interactions was higher. For instance, in a session with 20 players, a subject had a pool of 19 subjects with whom to be matched in the VRC, and of 10 players in the FRC. Moreover, it is also relevant from a strategic point of view that the probability of being matched *in the same role* in the future was clearly higher in the FRC than in the VRC. All this should lead to a higher incentive in creating reputational effects under the FRC than the VRC. However, the payment rule that has been chosen should have the effect of rescaling these probabilities to 10% of their actual value (see section 2). This means that the relevant probability of being re-matched with the same player in the future would be smaller than 7% in the VRC and 10% in the FRC, with the difference between the two being at most of 3%.

first round. Obviously, no history-contagion effect and correlation across individual histories can occur in the first round. We have used econometric specifications analogous to 1 and 2 to analyze behavior in the first round, (there is no need to control for $ROUND$ in this case).

$$PROPOSAL_{i,t} = \alpha + \delta j SETTING_j + \varepsilon_i + u_{i,t} \tag{3}$$

$$ACC_{i,t} = \alpha + \delta j SETTING_j + \eta OFFER + \varepsilon_i + u_{i,t} \tag{4}$$

In analogy to the foregoing sections, the tables below report the results for tests over the hypotheses of equality of some relevant combinations of parameters[18]. The overall regression results are reported in Tables 14 and 15, column 2. The main results are as follows:

- Proposals are significantly higher in all of the positive opportunity settings vis-à-vis the *0%-Opp* setting. This is the case at less than the 1% level of significance.
- In all but one case - namely, the *1%-Opp* vis-à-vis the *20%-Opp* - there exists a positive relationship between increase in the fairness of opportunity and proposers' demands. However, these differences are never significant across the three positive opportunity settings.
- Similarly, in all but one case - namely, the *1%-Opp* vis-à-vis the *20%-Opp* - there exists a positive relationship between increases in the fairness of opportunity and probability of acceptance. However, these differences are never significant across the three positive opportunity settings.

[18] For instance, the comparison between the *20%-Opp* and the *1%-Opp* settings is carried out through a test over the null hypothesis: $H_0 = (\delta_{20VRC} + \delta_{20FRC}) - (\delta_{1VRC} + \delta_{1FRC})$, where the coefficients $\{\delta_{20VRC}, \delta_{20FRC}, \delta_{1VRC}, \delta_{1FRC}\}$ are the coefficients for the dummies identifying the *20%-Opp VRC, 20%-Opp FRC, 1%-Opp VRC* and *1%-Opp FRC,* respectively, derived from the regressions reported in Table 14 and 15, column 2. In comparisons involving the *Eq-Opp* setting, we have multiplied the associated coefficient by 2 not to distort the comparison between this coefficient and the sum of other two coefficients. So, for instance, the comparison between the *Eq. Opp* setting and the *1%-Opp* settings will have null hypothesis given by: $H_0 = (2 \times \delta_{Eq\ Opp}) - (\delta_{1VRC} + \delta_{1FRC}) = 0$, where $\delta_{Eq\ Opp}$ is the coefficient for the dummy variable identifying the *Eq. Opp* setting.

Table 10: Difference in Proposals - ROUND 1

	0%-Opp	1%-Opp	20%-Opp	Eq-Opp
0%-Opp				
1%-Opp	2.97***			
20%-Opp	2.67***	-0.36		
Eq-Opp	3.04***	0.23	0.57	

Table 11: Difference in Acceptance- ROUND 1

	0%-Opp	1%-Opp	20%-Opp	Eq-Opp
0%-Opp				
1%-Opp	2.08**			
20%-Opp	1.73*	-0.13		
Eq-Opp	2.05**	0.74	0.81	

Therefore, these results confirm those illustrated in the previous sections of a strong 'symbolic' value of opportunity on people's behavior, and of a weak monotonic pattern in the interior of the opportunity region, which is reversed in one case. Therefore, the relevance of the symbolic aspect of opportunity does not appear to be brought about by the evolution of interactions, but is present from the very first round [19].

5.2 Results for Round 20 and for the existence of a trend

In this section we analyze only the last round. This allows focusing only on the static effect of opportunity, i.e. without a possible bias due to dynamic considerations. In particular, we have applied the same model to Round 20 as that used to analyze Round 1. The results are reported in Table 12 and 13 below, whereas the whole regression results are reported in Tables 14 and 15, column 3. The strongly significant differences in proposals between the *0%-Opp* setting and all of the other positive opportunity settings is evident. There are also clear non-monotonicities in the relation between reductions in the inequality of the opportunity allocation and proposals, which is in one case significant - namely, the *Eq-Opp* bringing less unequal proposals than the *20%-Opp* setting. The latter result is mainly driven by the VRC, on

[19] It has to be stressed, though, that the patterns illustrated above are not equally strong in the FRC and VRC. Differences are larger in the latter, whereas those in FRC are significant at conventional levels only in one case. The corresponding results are reported in Tables 16-19 in the Appendix.

which we have already commented. What is perhaps surprising is that this time no significant difference emerges with respect to acceptance rates, all the tests being largely insignificant (see Table 13). This is in stark contrast with the patterns of behavior observed in round 1 (Table 12) as well as for all rounds (Tables 8 and 4), which instead showed significant differences across some of the settings.

Table 12: Differences in Proposals - ROUND 20

	0%-Opp	*1%-Opp*	*20%-Opp*	Eq-Opp
0%-Opp				
1%-Opp	4.37***			
20%-Opp	6.35***	1.41		
Eq-Opp	3.01***	-0.97	-2.34**	

Table 13: Differences in Proposals - ROUND 20

	0%-Opp	1%-Opp	20%-Opp	Eq-Opp
0%-Opp				
1%-Opp	0.54			
20%-Opp	0.74	0.16		
Eq-Opp	0.24	-0.30	-0.48	

In spite of the low incentives to create reputation effects (see section 2), it is all the same possible that responders' behavior was partly motivated by the objective to induce proposers to reduce their claims *in future rounds.* This may add a further motivation to the objective of *altruistic punishment,* which has already been highlighted in the literature (Henrich *et al.*, 2001), and which may be at work in both a static as well as in a dynamic setting. Rather than on altruistic grounds, this motivation may be self-interested in character in that punishing a subject in the current round may increase the probability of a higher offer in the future, especially in the FRC. In fact, we already observed that the probability of acceptance is far higher in the VRC - where the pool of possible proposers averaged 20 subjects - than in the FRC - where the pool of possible matches was on average a half of that amount (see Table 10). If this conjecture is true, then we should observe an *increasing* trend in probability of acceptance, because the 'future' value of a punishment in the current period decreases as the number of future rounds diminishes.

We can test this conjecture by modifying our econometric models to include a trend and an interaction term. Since we are interested in a comparison between the FRC and VRC, we rule out observations coming from the *Eq. Opp* setting, and we apply the following models to our data:

$$PROPOSAL_{i,t} = \alpha + \beta_t ROUND_t + \gamma TREND + \theta FRC + \mu TREND * FRC + \varepsilon_i + u_{i,t}$$

$ACCEPTANCE_{i,t} = \alpha + \beta_t ROUND_t + \gamma TREND + \theta FRC + \mu TREND * FRC + \eta SHARE + \varepsilon_i + u_{i,t}$

$TREND$ is a variable that simply equals the number of the round to which an observation refers, and thus captures the existence of trends in the evolution of proposals and acceptance rates over time. FRC is a dummy variable identifying all settings coming from the FRC, and $TREND * FRC$ is the interaction term between the two. The overall results of the regressions are reported in Tables 14 and 15, columns 4. In summary, we can conclude that trends exist for both conditions, but they are more marked in the VRC. More precisely, a trend is strongly significant under the VRC for both proposals (γ =0.032; z=6.28, p-value<0.000; N= 3640) and acceptance rates (γ =0.084; z=2.82, p-value=0.005; N= 3357). It is significant for proposals ($\gamma + \mu$ =0.010; z=2.22, p-value=0.027; N= 3640) and weakly significant for acceptance ($\gamma + \mu$ =0.049; z=1.78, p-value=0.075; N= 3357) in the FRC. The sign of the coefficient in the acceptance rate regression is positive, which means that the probability of acceptance *increased, ceteris paribus,* over time. Therefore, our conjecture that responders' behavior 'softened up' over time because of the shortening time horizon is supported by this analysis. The fact that the trend was steeper in the VRC may be due to the fact that responders had a higher incentive to be 'tough' in each round because of the smaller proposers' pool, and they started to be so from the very beginning. In fact, the coefficient θ is negative and significantly different from 0 in the regression over acceptance (see Table 15, column 4). We can infer that this sort of 'inter-temporal self-interested punishment' may be at work, although 'ethical' preferences over the overall fairness of the interaction may be interfering with this motive, too.

6 Discussion

In this section we will try to move towards an explanation, which will connect the concept of opportunity with allocation inequality. Our results show the presence of a generally increasing monotonic pattern in the relationship between fair allocation of opportunities on the one hand, and proposal and probability of acceptance on the other- although this is violated in some cases in the VRC. Secondly, and more significantly, there is a discontinuous jump between the two settings that offers no opportunity to one of the players and a positive but symbolic opportunity. In particular, no opportunity settings lead to significantly more equal outcome than the other ones. This suggests that an explanation based on traditional models, be it distributional or reciprocal fairness will be unsatisfactory. It is clear that our results demand a new explanation or at least some generalization of the traditional models.

Before introducing our explanation, let us briefly discuss why traditional models fail to explain our result. There are two main stream of arguments which departs from the traditional rational choice theory and offer explanations for the anomalies observed in laboratory experiments (see Sobel 2005, for a survey). The first group of models assume that individuals maximize well defined preferences, but permit preferences to depend on the payoffs of other players. Fehr and Schmidt (1999), Bolton and Ockenfels (2000) among others have followed this line and have suggested specific functional form for interdependent preferences. These utility function, in general, could be written in the following form

$$u_i(x) = x_i + \lambda_{ij}(x_i - x_j)x_j$$

$u_i(x)$ is agent i's utility given an allocation x where x_i and x_j denote the shares of i and j respectively. The function λ_{ij} is the source of interdependence - it connects i's utility with j's share. In this formulation, it is easy to see that irrespective of the opportunity level, the responder's behaviour in a UG always remains the same. Hence, proposers' behaviour will also remain unaffected by the opportunity level as well as the *ex-post* inequality in allocation. The other stream of argument is based on reciprocity and permits the preference over outcome to depend on the context in which the outcome was reached . Although context dependence sounds promising in our setup, none of the models explain (see Rabin (1993) for instance) the association between allocation and opportunity. In particular, note that, all these models are 'continuous' in nature and will be unsuitable to explain the discontinuous jump, we observe, between no opportunity and positive opportunity settings.

Here, we demonstrate that a simple combination of inequality aversion model with Nozick's symbolic utility can be consistent with our observation. It would be proper to mention at this stage that our aim is no broader than that. We neither claim this to be the only possible explanation nor we propose symbolic utility to be the basis of a new social utility model. The analysis we sketch here are rudimentary and left many important questions unanswered.

6.1 Envy factor dependent on 'Opportunity'

We propose a simple extension of the inequality aversion model introduced by Fehr and Schmidt (1999). In a two-person society , Fehr-Schmidt utility function of an agent can be represented as follows:

$$u_i(x) = x_i - \alpha_i \max(x_j - x_i, 0) - \beta_i \max(x_i - x_j, 0)$$

where x_i and x_j are share of agent i and j respectively. $\alpha_i \geq 0$ is the envy factor and $0 \leq \beta_i \leq \alpha_i$ is the altruism factor. Our experimental results, in particular, rejection rate across different opportunity level suggests that 'opportunity' enters into the utility function through the envy factor. That is α_i is not a constant but depends on p, where p is a measure of opportunity. We have already argued that in our settings it is simply the probability with which a proposal from an unfavoured player is selected as a proposal. Thus p can vary between 0 and 0.5. Moreover, one can expect that the higher the difference in opportunity levels between the two players, the stronger the envy factor. That is $\alpha_i(p)$ is a decreasing function in p. Following Fehr and Schmidt, we assume that the proposer does not know the exact value of the envy factor of the responder, but knows that it is distributed according to some distribution function $F_p(\alpha)$. The equivalent of decreasing function $\alpha_i(p)$ in this setup is as follows. If $p_1 > p_2$ then F_{p_2} first order stochastically dominates F_{p_1}.

To keep our model simple we will assume $\beta_i = 0$ and we will use our toy model to explain two main observations: *i*) *ceteris paribus*, a decrease in inequality of opportunity (that is, an increase in p) increases the probability of acceptance of a proposal and *ii*) a decrease in inequality of opportunity increases the inequality of the allocation.

Suppose j is the proposer and i is the responder. Since, x_i and x_j denote the share of agent i and j respectively, we have $x_i + x_j = 1$. First note that in equilibrium, $x_j \geq 0.5$. Otherwise j can increase her utility because any $x_j < 0.5$ will be accepted by i. Thus $(x_j - x_i) \geq 0$ and agent i accepts a proposal if and only if $[x_i - \alpha_i(x_j - x_i)] \geq 0$. Equivalently, if j makes an offer x_i, it is accepted by i if and only if he has $\alpha_i \leq \frac{x_i}{1-2x_i}$. Hence, the probability with which x_i is accepted is $F_p\left(\frac{x_i}{1-2x_i}\right)$. If $p_1 > p_2$ then F_{p_2} first order stochastically dominates F_{p_1}, implying $F_{p_1}\left(\frac{x_i}{1-2x_i}\right) \geq F_{p_2}\left(\frac{x_i}{1-2x_i}\right)$. That is probability of acceptance increases with p.

Now, the expected payoff of the proposer is $\left[(1-x_i)F_p\left(\frac{x_i}{1-2x_i}\right)\right]$. Thus agent j chooses x_i which maximizes $\left[(1-x_i)F_p\left(\frac{x_i}{1-2x_i}\right)\right]$. The first order condition is as follows,

$$\frac{(1-x_i)}{(1-2x_i)^2} = \frac{F_p\left(\frac{x_i}{1-2x_i}\right)}{f_p\left(\frac{x_i}{1-2x_i}\right)} \tag{5}$$

where f_p is the density function. To show our next result on allocation inequality, we need to make further assumptions on F. We assume that f is non increasing. Moreover we only consider one particular type of first order stochastic dominance which comes from a shift in the support. For example, consider the following family of exponential distribution,

$$f_p(t) = \begin{cases} \lambda e^{-\lambda(t-a(p))} & \text{if } t \geq a(p) \\ 0 & \text{otherwise} \end{cases}$$

where $a(p)$ is a decreasing function of p. One can check that if $p_1 > p_2$ then $F_{p_1}(t) \geq F_{p_2}(t)$ for all t. $p_1 > p_2$ also implies $a(p_1) < a(p_2)$ and hence for all t, $f_{p_1}(t) \leq f_{p_2}(t)$. Therefore, for all x_i

$$\frac{F_{p1}\left(\frac{x_i}{1-2x_i}\right)}{f_{p_1}\left(\frac{x_i}{1-2x_i}\right)} \geq \frac{F_{p2}\left(\frac{x_i}{1-2x_i}\right)}{f_{p_2}\left(\frac{x_i}{1-2x_i}\right)} \tag{6}$$

Note that the left-hand side of Equation 5 is an increasing function of x_i and starts above the right hand side (at $x_i = 0$). Let $x_i(p)$ be the equilibrium share of the pie that j offers to i, where

$$x_i(p) = \{\min x_i | x_i \text{ satisfies Equation 5}\}$$

Thus for all $x_i < x_i(p_1)$, we have $\frac{(1-x_i)}{(1-2x_i)^2} > \frac{F_{p1}\left(\frac{x_i}{1-2x_i}\right)}{f_{p1}\left(\frac{x_i}{1-2x_i}\right)}$. By Equation 6, $\frac{(1-x_i)}{(1-2x_i)^2} > \frac{F_{p2}\left(\frac{x_i}{1-2x_i}\right)}{f_{p2}\left(\frac{x_i}{1-2x_i}\right)}$ for all $x_i < x_i(p_1)$. Therefore $x_i(p_2) \geq x_i(p_1)$. That is inequality of allocation increases with a decrease in inequality of opportunity. From the data we observe a jump from $p = 0$ to $p = 0.01$, which can be obtained on our post-hoc model if we assume that there is a jump from F_0 to F_p for any $p > 0$. But how can we explain this jump?

6.2 Symbolic value of Opportunities?

This is where, we believe Nozick's symbolic utility comes in. Even a minimal opportunity can make agents significantly less envious[20]. Following Nozick (1993, pp 27.28): "Having a symbolic meaning, the actions are treated as having the utility of what they symbolically mean [...] Since symbolic actions often are expressive actions, another view of them would be this: the symbolic connection of an action to a situation enables the action to be expressive of some attitude, belief, value, emotions or whatever. Expressiveness not utility is what flows back."

Accordingly, our conjecture is that the act of making a proposal may symbolize, for the unfavoured player, opportunities independently on the

[20] To use a popular phrase 'people blame misfortune for their situation rather than the system'.

expected utility coming from having this option. The difference between F_0 and $F_{0.1}$ is the fact that in the last case an action symbolizing the opportunity of being a proposer has been taken. This may then explain the discontinuity between F_0 and $F_{0.1}$.

This seems consistent with what Nozick writes later (p. 34): "Sometimes, though, the presence of probabilities rather than certainty may remove a symbolic meaning altogether. It is not the case that half or one-tenth chance of realizing a certain goal always itself has half or one tenth the symbolic utility of that goal itself–it need not symbolize that goal, even partially."

The above model and our interpretation of the difference between $p = 0$ and $p = 0.01$ as symbolic are consistent with our main results. However, as we already mentioned in this section we put forward our theoretical sketch as a possible justification rather than a full-blown explanation.

7 Summary

We studied the impact on wealth distribution of varying the degree of opportunity that a player has of becoming the proposer in an UG. We compared the outcomes of four different settings according to the degree of opportunities. Our results clearly indicate that allowing players positive opportunities of being selected as proposers radically change the payoff distribution and the conflictuality rates. In particular, offers are on average lower and the probability of acceptances higher when the rules have positive opportunities for both players compared to when they are absent for one player. This relationship is monotonic in the level of opportunity, but highly concave: the differences both in terms of proposals and acceptance rates are strongly significant comparing the 1% opportunity to the no opportunity setting; whereas no significant differences emerge between the 1% opportunity setting and the other positive opportunity settings. The effect of intertemporal allocation of opportunity seems instead to lead to a strong monotonic pattern between the condition with intertemporal inequality of opportunities (FRC) and intertemporal equality (VRC). This supports our initial assumption that also intertemporal opportunity have an effect on wealth allocation as well. Therefore, subjects in our experiment appears to be motivated mostly by a purely symbolic opportunity rather than by the actual fairness in the allocation of opportunities. This lend some support to Nozick's idea that individuals attach symbolic values to action.

8 Appendix

Table 14: Econometric Analysis of Proposals

DEPENDENT VARIABLE: *PROPOSAL*				
	(1)	(2)	(3)	(4)
Rounds	ALL	1	20	ALL
Random Effect	Yes	No	No	Yes
1%-Opp FRC Dummy	0.491***	0.367	0.580***	
	(0.17)	(0.27)	(0.22)	
20%-Opp FRC Dummy	0.614***	0.445	0.740***	
	(0.17)	(0.27)	(0.20)	
Eq. Opp Dummy	0.684***	0.611**	0.724***	
	(0.16)	(0.26)	(0.19)	
0%-Opp VRC Dummy	0.269*	-0.120	0.515***	
	(0.16)	(0.33)	(0.18)	
1%-Opp VRC Dummy	0.907***	0.765***	1.189***	
	(0.16)	(0.29)	(0.21)	
20%-Opp VRC Dummy	1.097***	0.554*	1.435***	
	(0.16)	(0.29)	(0.19)	
FRC Dummy				-0.164
				(0.13)
$TREND$				0.0315***
				(0.0050)
$FRC \times TREND$				-0.0210***
				(0.0059)
Constant	6.028***	6.219***	6.260***	6.627***
	(0.14)	(0.21)	(0.15)	(0.10)
ROUD DUMMIES	YES	-	-	YES
Observations	4880	244	244	3640
cross section units	332	-	-	270
R^2 (adjusted)		0.0402	0.174	
R^2 (overall model)	0.108			0.0516
R^2 (between model)	0.164			0.0478

*** p<0.01, ** p<0.05, * p<0.1, Robust standard errors in parentheses

Table 15: Econometric Analysis of Acceptance Rates

DEPENDENT VARIABLE: ACCEPTANCE				
	(1)	(2)	(3)	(4)
ROUNDS	ALL	1	20	ALL
Random Effects	Yes	No	No	Yes
$OFFER$	2.906***	1.523***	1.364***	2.774***
	(0.12)	(0.27)	(0.34)	(0.13)
1%-Opp FRC Dummy	1.748***	0.366	1.145	
	(0.67)	(0.86)	(0.79)	
20%-Opp FRC Dummy	2.592***	1.026	1.591**	
	(0.68)	(1.06)	(0.81)	
Eq.Opp FRC Dummy	3.292***	1.530	1.547*	
	(0.64)	(1.04)	(0.83)	
0%-Opp VRC Dummy	2.285***	-0.596	2.685**	
	(0.66)	(0.87)	(1.19)	
1%-Opp VRC Dummy	3.493***	1.568*	2.415**	
	(0.66)	(0.92)	(1.13)	
20%-Opp VRC Dummy	4.733***	0.760	2.179***	
	(0.69)	(0.87)	(0.84)	
$TREND$				0.0842***
				(0.030)
FRC Dummy				-1.682***
				(0.44)
$FRC * TREND$				-0.0348
				(0.026)
Constant	-7.999***	-3.589***	-3.405***	-4.599***
	(0.72)	(1.17)	(1.31)	(0.55)
ROUND DUMMIES	YES	-	-	YES
Observations	3977	197	198	3357
cross section units	332	-	-	270
chi2	579.8	35.77	17.37	505.1
p-value	0	0	0	0

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 16: Differences in Proposals - FRC - Round 1

	0%-Opp	1%-Opp	20%-Opp
0%-Opp			
1%-Opp	1.34		
20%-Opp	1.63	0.32	
Eq-Opp	2.35 ∗ ∗	1.08	0.74

Table 17: Differences in Proposals - VRC - Round 1

	0%-Opp	1%-Opp	20%-Opp
0%-Opp			
1%-Opp	2.76***		
20%-Opp	2.12**	−0.75	
Eq-Opp	2.53*	−0.62	0.23

Table 18: Differences in Acceptance - FRC - Round 1

	0%-Opp	1%-Opp	20%-Opp
0%-Opp			
1%-Opp	0.43		
20%-Opp	0.97	0.74	
Eq-Opp	1.47	1.37	0.52

Table 19: Differences in Acceptance - VRC - Round 1

	0%-Opp	1%-Opp	20%-Opp
0%-Opp			
1%-Opp	2.73 ∗ ∗∗		
20%-Opp	1.83∗	0.246	
Eq-Opp	2.27 ∗ ∗	−0.05	0.94

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9 Instructions for 1%-Opp FRC

Welcome to this research project. A team of researchers is looking at the way in which people make decisions. If you pay close attention to the instructions then you could make a significant amount of money. If you wish, you can follow the instructions on the screen in front of you.

The research team that is here today includes myself, Gianluca Grimalda, and my assistants.

Before starting with the explanation of the decisions you are going to make, please pay attention to some important information and recommendations.

In this project you are going to be asked to make decisions with other people who are currently in this room. Your choices, and the choices of others, will be matched with the help of a computer programme as we proceed. It is important for you to note that all interactions are entirely anonymous. Firstly, we will not know anything about your choices and your payment. We will just record your choices through the ID number that you have just drawn, and the payments will be made using that number as identification. It is therefore important that you do not lose the card you have drawn, because that is the only document that enables you to be paid. You may collect your payments at the end of this session. You will be required to sign a receipt, but there is no need for you to print your name. University administration does require that you write in your student number when signing this receipt. However, your student number will be held confidentially by our research group, and we will not make any attempt to link your student number to the decisions you have made.

At the end of your decisions, while we prepare your payments, we would ask that you complete a short questionnaire. You are required to state your Student ID number. Even in this case, your responses to this questionnaire will be held under confidentiality rules by our research group.

Secondly, the decisions you are going to make involve interacting with other people who are present in this room. However, you will not have to talk or communicate directly in any way with anybody in this room. Instead, your decisions will be processed through a computer programme that networks all of the computers in this room. In this way, nobody will be able to identify with whom s/he is actually making decisions. The interaction will proceed as follows: You will receive some messages on the screen in front of you. This will either include some information on the state of the decisions, or prompt you to make certain choices. Once you are sure about your choice, you have to press the button OK, which will take you to the next stages of the decisions. At times, you will be asked to wait for further instructions, because it may take a bit of time before the programme processes all your decisions.

If you are not clear on this or on other issues, please raise your hand.

You will be involved in 20 different interactions with other people in this room. In each interaction, you will be paired with another person, and the two of you will be making a decision together. Our programme will draw at random the pairs at the beginning of each interaction. This means that with very high probability you will be paired with a different partner at each interaction.

As you will see, the decisions involve money. In each decision there will be £10 at stake. Unfortunately, we will not be able to pay you for each decision you make, but only for TWO interactions out of the 20. These will be drawn at random at the end of this session, and everyone will be paid according to the outcome of those 2 rounds. In this way, you are required to pay maximum attention to each decision you are going to make, because only at the end of the session we will learn which ones determine your payments.

Some final recommendations: You are asked to be quiet throughout the session. You must not talk with anybody else, or look at others' computer screens. Anyone infringing these simple rules will be asked to leave the room.

You can now press the OK button and go to the next screen.

We are now going to look at the simple rules that will govern each of the interactions:

- An amount worth £10 is to be divided between you and the person you have been paired with.
- Both of you are asked to make a proposal. Your proposal is any amount X less than or equal to £10 that you want to keep for yourself. You may use any number up to the second decimal digit. The residual amount (10-X) is to be assigned to the other person you have been paired with.
- Once you and the other person in your group have submitted your proposals, one of them is drawn at random. The random selection works as follows. Half of the people in this room are favored with respect to the others in having their proposals selected. In particular, half of the people have a 99% probability that their proposals will be selected within their groups, whereas the others have a 1% probability.
- You will be informed about which probability your proposal has of being selected in the first round, and this probability will remain the same throughout all the remaining rounds. Each group will be made up of a person with a 99% probability and another person with a 1% probability of their proposals being selected.
- The person whose proposal has been selected (the 'proposer') is asked to wait for the decision of the other person in the group. The person whose proposal has not been selected (the 'receiver'), is informed of the share allocated to him/her by the proposal of the other person. She is then asked to either ACCEPT or REJECT this proposal.
- If the receiver accepts this proposal, then everyone gets the share determined by this proposal. If the receiver rejects this proposal, then both people in the group get £0 each.
- At the end of each interaction, a new random draw will take place to determine your next partner. This will be a person from the half of the people in this room with a probability different from yours of their proposals being selected. It is therefore very unlikely you will be paired with the same person again. Moreover, all decisions are independent. What you do in a round does not influence the next rounds and is not influenced by the previous rounds.

For instance, if you reject a proposal in one interaction, it doesn't mean that you also reject those that came before, of those that will come afterwards.

Let's see an example together. Please write in the answers if you wish.

a) In the first round Person A is informed that she has 99% probability of having her proposal selected, and Person B is informed that his proposal has 1% probability of being selected. Person A makes the proposal to keep £6.50 for herself. Person B makes the proposal to keep £8.55 for himself. Person

A's proposal is selected, and person B – the 'receiver' - accepts. What is their final allocation?

- Person A ....6.50..........
- Person B ....3.50..........

b) In the second round Persons A and C are reminded that the probability of having their proposals selected are 99% and 1%, respectively. Person A makes the proposal to keep £2.50 for herself. Person C makes the proposal to keep £5.50 for himself. Person C's proposal is selected, and Person A – the 'receiver' - rejects the proposal. What is their final allocation?

- Person A ....0.......
- Person C ....0.......

"We now want to make sure that you have understood the rules of the interaction correctly. Please turn the page and fill out the answers to the examples. When you have finished raise your hand. One assistant will come and check that your answers are correct, and will collect the sheet.

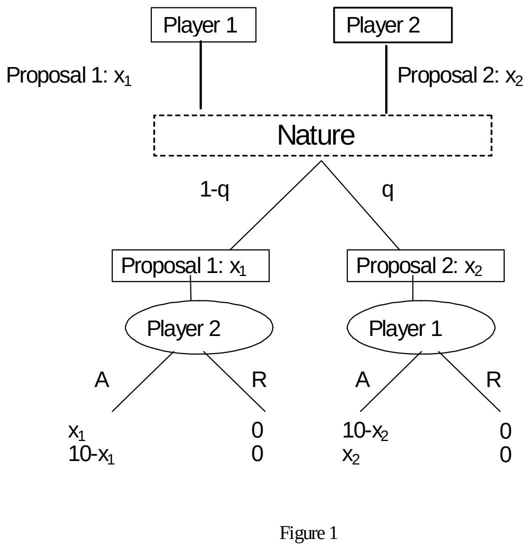

Figure 1: The stage game

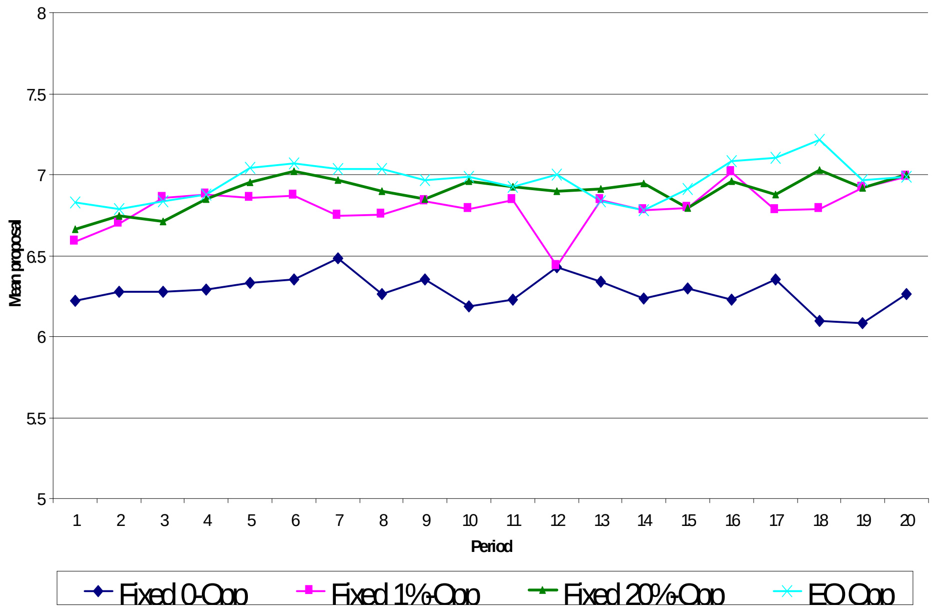

Figure 2: Evolution of Proposals

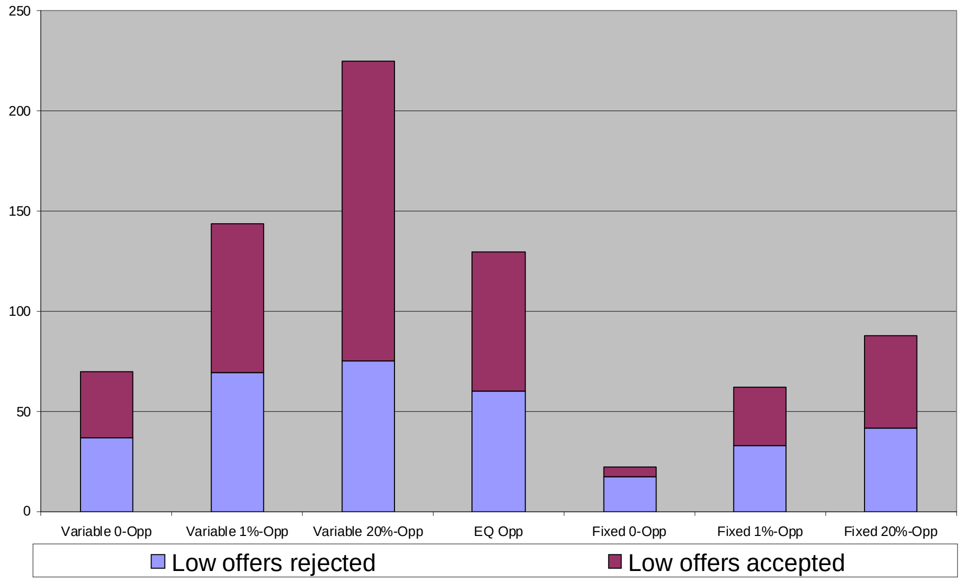

Figure 3: Low offers

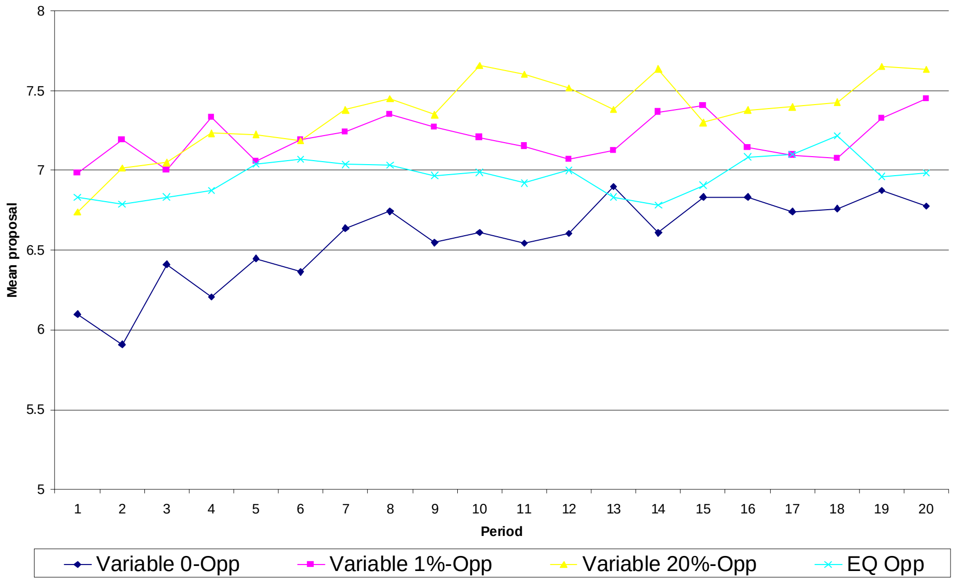

Figure 4: Proposal VRC