Everyone Wants a Chance: Initial Positions and Fairness in Ultimatum Games

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Abstract

We investigate experimentally the modification of initial chances to acquire advantaged positions in bargaining problems. In the baseline case players have equal opportunities to acquire the advantaged position. Chances become increasingly unequal across three treatments. We find: (1) The more unequal initial chances, the lower acceptance rates of a given split; consequently inequality decreases. (2) Players react significantly to being assigned a purely symbolic 1% chance of occupying the advantaged position compared to having no chance; (3) Players respond to the way opportunities are distributed across periods of time. These results confirm and extend cross-national survey evidence concerning the relevance of procedural fairness for redistributive preferences.

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1 Introduction

"[...]*All are equal, all are free, and all deserve a chance to pursue their full measure of happiness." (from Barack Obama's swearing-in speech after the 2008 US elections).*

Equality of initial opportunities is one the founding principles of distributive justice in contemporary societies (Rawls, 1999; Roemer, 1998). A large amount of resources is spent to "level the playing field" in many developed countries. A clear example is public spending on primary and secondary education[1]. Fairness in the allocation of initial positions emerges as a key factor for individuals' redistributive preferences and attitudes. Corneo and Gruner (2002) find that people believing that "coming from a wealthy family is important for getting ahead in life" are also more supportive of income redistribution. More generally, believing that the economic system permits upward mobility to deserving people - in other words, believing that the system is "fair" - reduces demand for redistribution (Fong, 2001; Alesina and La Ferrara, 2005). Since the belief that the society grants opportunities for climbing the economic ladder is more widespread in the US than in Europe (Gilens, 1999), procedural fairness has been deemed to be at the root of the lower income redistribution taking place in the US vis-à-vis Europe (Fong *et al.* 2005; Alesina and Angeletos, 2005; Benabou and Tirole, 2006).

The goal of this paper is to to examine experimentally the way people evaluate and react to modifications in the fairness with which initial positions are assigned. We compare a situation of perfect equality of opportunity

[1] In 2008 the average public spending on primary and secondary education was 3.6% of GDP in OECD countries (OECD, 2011). US expenditures were slightly above OECD average and continental European countries expenditures, whilst they were much lower in other public expenditure provisions (Alesina and Angeletos, 2005: 960). This can be interpreted as a general expression of political support for policies equalizing initial positions. See also Lipset (1997).

with others in which initial chances are increasingly biased in favor of some individuals. At the other extreme, we consider a situation where some individuals have no chance of accessing the most advantaged initial position. We are the first, to the best of our knowledge, to address the issue of fairness in the assignment of *initial positions* proper within an experimental approach.

Given that most societies fall short of the ideal of equality of initial opportunity by a greater or smaller margin (see e.g. Bowles *et al.*, 2008; Deshpande, 2011), it is important to understand how deviations from the ideal of a fully level playing field are perceived by individuals. Indeed, many people judge their society to fail to provide a fair amount of opportunities. 77% of the participants in the 2006 International Social Survey Programme responded that the government should spend "more" or "much more" on education - even if that implied increased taxation - in a sample including 33 countries (ISSP, 2006)[2]. Even in the US, the country traditionally seen as the "land of opportunity" (Alesina and La Ferrara, 2005), 29% of respondents to the 1998 Gallup Social Audit declared that *"all Americans do not have an equal opportunity to succeed"* (Gallup, 1999). Corneo and Fong (2008) find this measure of availability of opportunity to be a strong (negative) predictor of individual preferences for redistribution. Procedural fairness is also vital to many other aspects of economic decisions, such as job selection procedures and firms' wage structure (Bewley, 1999).

We take the Ultimatum Game (UG henceforth) as our basic interaction. This game has been used extensively to examine individuals' assessment of the fairness of payoff allocations. Interactions in the UG take place from *asymmetric* positions. The *proposer* in a UG has a first-mover advantage

[2] Education comes second after health as the item for which respondents want most to increase public spending, ahead of pensions, law enforcement, the environment, unemployment benefits, culture and arts, and defence (ISSP, 2006).

over the *receiver* in that she can dictate the shares of the final allocations. 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. Oosterbeek *et al.* 2004). Guth and Tiez (1986) show that when subjects are asked to bid on the two positions of a UG before bargaining, they offer twice as much to occupy the proposer's role as they do for the receiver's role. Arguably, the proposer's position is more desirable than the receiver's. For this reason, a lottery giving one player higher chances of being assigned the proposer's role than another player, can conceivably be seen as not being fully *fair*.

The main novelty of our experimental design is to make the access to the two UG roles subject to a lottery, and to manipulate the distribution of probability of these lotteries. The baseline case is both players having *equal opportunities*, as the lottery assigns both individuals a 50% chance of acquiring the proposer role. In the other treatments, the initial lottery is biased in favour of one of the two players. We consider three treatments in which one of the two players is *favored* with respect to the other in that she has, respectively, 80%, 99%, and 100% probability of becoming the proposer, while the *unfavored* player only has the residual probability. We call p $(1-p)$ the probability that the *unfavored (favored)* player has of becoming the proposer, where $p = \{0; 1\%; 20\%;\ 50\%\}$. This is the key parameter of our design. In this way we are able to assess the impact of increasing disparity in the distribution of initial chances on individual assessment of allocation fairness.

We also study another dimension of procedural fairness, relative to the distribution of opportunities over time. In what we call the fixed role condition (FRC), an unfavored player remains disadvantaged throughout the 20 interactions of the experiment. Under the variable role condition (VRC), positions are reassigned before each round. In section 3 and Appendix A we claim that the VRC provides for *overall* equality of opportunity across the whole 20 rounds of the experiment, though a player may be disadvantaged *within* individual rounds. We believe our study to be the first to tackle the issue of the inter-temporal distribution of opportunities.

Section 2 presents the theoretical background for our study. We illustrate the main hypotheses and the experimental protocol in section 3. Section 4 reports the results. Section 5 concludes the paper.

2 Literature review and theoretical framework

The experimental research on how procedural fairness impinges upon the outcomes of a social interaction is still at an early stage of development. In a seminal study, Bolton, Brandts and Ockenfels (2005) (BBO henceforth) showed that procedural fairness - intended as equal chances to achieve unequal outcomes - is a substitute for outcome fairness - intended as outcome equality. Other studies replicated this result, showing that equality of opportunity is not a *full* substitute for equality of outcomes (see e.g. Becker and Miller, 2009; Krawczyk and Le Lec, 2010). In a second study, BBO showed that procedures that are strongly biased in proposers' favour are disapproved by receivers. Karni *et al.* (2008) showed that about 50% of their sample were willing to sacrifice self-interest for higher procedural fairness. In subsequent studies, modifications in procedural fairness did not lead to any appreciable change in individual decisions (Krawczyk, 2010; Cappelen *et al.;* 2010), though this may be due to the simultaneous presence of individual merit and procedural concerns as motivational factors[3]. These studies leave some important questions still unanswered, such as in particular the relevance of procedures applied to initial positions rather than to final outcomes, and the impact of assigning individuals purely symbolic chances. This will be the focus of this paper.

At the the theoretical level, individual preferences have traditionally been held as being *consequentialist* (Hammond, 1988; Machina, 1989; Trautmann and Wakker, 2010; Fudenberg and Levine, 2012). These models posit that individual preferences only depend on final outcomes, disregarding the process leading to such outcomes. Note that consequentialist models allow for preferences being either purely self-interested, or *other-regarding*, such as those modelled in Fehr and Schmidt's (1999) (FS henceforth), Bolton and Ockenfels's (2000) (BO henceforth), and Charness and Rabin (2002).

An alternative route has been taken over the past decade, with the development of models of procedural fairness[4]. The general idea is that individuals' preferences are assumed to depend on the impartiality of the procedure determining final outcomes, as well as on outcomes proper. The higher the fairness of the process, the higher individuals' utility. Karni and Safra (2002) offer an axiomatic account of individuals' sense of fairness. This builds on Diamond's (1967) idea that individuals prefer fair procedures to biased ones, even when these lead to unfair outcomes. Various models of procedural fair-

[3]Another strand of literature has used individual relative merit in performance-based tasks as the determinant of initial positions in UGs or Dictator Games (e.g. Hoffmann and Spitzer, 1985; Burrows and Loomes, 1994; Schotter et al., 1996; Ruffle, 1998; Hoffman *et al.*, 1994). Therefore, in these studies initial positions are linked to individual merit, rather to random chances as in our study. See also Schurter and Wilson (2009).

[4]A first departure from consequentialist models had been proposed in theories of intention-based reciprocity (Rabin, 1993), where individual utility is assumed to depend not just on final outcomes, but also on the intention - nice or spiteful - perceived in other players in bringing about such outcome. Clearly the manipulation of initial chances has nothing do with individual intentions, so this class of models would predict no treatment effect in our study.

ness have since been speficied (BBO; Trautmann, 2009; Krawczyk, 2011). A common characteristic of these models is to use the *expected* payoff difference between individuals as a *proxy* for the unfairness of the procedure. Fair processes should lead to no differences in expected payoffs. This approach is however somewhat unsuitable to make predictions in our study[5]. In this section we follow a different route and offer a simple model to clarify our hypotheses and to account for our results. The model we develop is specified for our framework, thus we do not claim any pretense of generalisability to other empirical results.

Our approach is to modify the FS utility function, by making the two basic other-regarding parameters a function of the procedural fairness of the interaction. In analogy with Karni and Safra (2002), we simply associate procedural fairness with p, i.e. the bias in the lottery of the stage game (see sections 1 and 3). Accordingly, an agent's utility can be represented as follows:

$$u_i(x) = x_i - \alpha_i(p)\max(x_j - x_i, 0) - \beta_i(p)\max(x_i - x_j, 0) \tag{1}$$

where x_i and x_j are agent i and j's payoffs, respectively. $\alpha_i(\beta_i)$ are the envy (altruism) factor. FS draw on empirical evidence to claim that realistic restrictions for these parameters are $\alpha_i \geq 0$ and $0 \leq \beta_i \leq \alpha_i$. Our main hypothesis is that, in addition to this restriction, there exists a non-increasing relationship between both α_i and β_i and p. We posit:

$$\frac{\partial \alpha_i(p)}{\partial p} \leq 0; \frac{\partial \beta_i(p)}{\partial p} \leq 0, p \in \left[0; \frac{1}{2}\right] \tag{2}$$

[5]These models would need to be differently specified to accommodate procedures determining initial positions. For instance, Trautmann (2010) suggests that subjects' willingness to pay prior to the play of the game may replace expected payoff differences.

This assumption is consistent with Krawczyk's (2011, 16) hypothesis of inter-dependence between procedural fairness and distributive justice. The upshot is that an agent being faced with a less fair initial procedure will be more sensitive to payoff inequality. Consequently, the higher the bias in the initial lottery, and the higher the unfairness in the procedures, the higher the envy and altruism factors. In a UG, receivers will be more inclined to reject the same offer when this has been generated from a procedure that is less fair than another one. In Appendix B we provide the proof that this model can accommodate for our main findings within an equilibrium analysis. In the Supplementary Online Material (SOM) we also perform a calibration exercise to find the value of α_i coherent with our data.

3 Experimental design and hypotheses

The game tree of the interaction is displayed in Figure 1. £10 are at stake in every round. Two players are matched to play an extended version of a UG. First, players are assigned the position of either Player 1 or Player 2 through an even random draw. We call this initial lottery $L1$. In the second phase, players are informed of the result of $L1$ and make an offer to their counterpart. An offer is a proposal on how to divide the £10 sum between the pair. Formally, player i's offer is a division $(x_i, 10 - x_i)$, where x_i is the amount player i demands for herself and $10 - x_i$ is the residual being offered to the counterpart, $i \in \{1, 2\}$. At this phase players do not know the counterpart's offer.

In the third phase, one of the two offers is selected at random through a lottery that we call $L2$. The key aspect of the design is that treatments differ according to the probability with which Player 2's offer (Player 1's offer) is randomly selected. This is given by the probability p $(1-p)$. Such probability has a maximum at $p = 0.5$ for Player 2 in the 50% treatment, it goes down to $p = 0.2$ in the 20% treatment, it goes further down to $p = 0.01$ in the 1% treatment, and finally reaches a minimum of $p = 0$ in the 0% treatment. Player 1 always has a complementary probability to Player 2's. Since in all treatments apart from the 50% treatment, Player 2 (Player 1) always has a lower (higher) probability of having her proposal being selected, we also call such player *unfavored* (*favored*).

Finally, in the fourth phase, the player whose proposal has *not* been selected has to decide whether she accepts or rejects the other player's offer. Suppose it is player i's offer that is selected. Player i is informed that her offer has been selected, but does not receive any information about player j's offer. Conversely, x_i is communicated to player j, who can either accept or reject that offer. If player j accepts, payoffs are x_i and $1 - x_i$ for player i and player j, respectively. If player j rejects, both players' payoff is 0.

INSERT FIGURE 1 ABOUT HERE

The key difference between our extended UG and a standard UG is the introduction of lottery $L2$, which randomly selects the offer that becomes relevant for the final allocation. Note that players are always informed of the lotteries outcomes. In particular, at the top node of the decision tree people are aware as to whether they are favored or unfavored at the moment of submitting their proposal. In the 0% treatments, when $p = 0$, we dispensed Player 2s from submitting an offer, as this would have no possibility of being selected. Both Suleiman (1996) and Handgraaf *et al.* (1998) follow a similar strategy in *not* asking players to perform an action when this has a 0% probability of being relevant to the game. We discuss the implications of this feature in section 5. After $L2$ has been run, the interaction becomes exactly like a UG. The player whose proposal has (not) been selected becomes the proposer (receiver), and payoffs are determined as in standard UGs. All random draws in $L1$ and $L2$ were made by the computer.

Both lotteries in our experiment represent purely procedural additions to the bargaining stage that brings about no strategic consequences. Applying backward induction, in the fourth phase of the game, a receiver interested in maximising her payoffs should accept any positive amount being offered. This should be anticipated by a rational proposer in phase 2, who should then offer the lowest possible sum to the counterpart. Consequently, the only Subgame Perfect NE (SPNE) for rational payoff-maximisers under common knowledge of rationality is, as in standard UGs, the offer $(10 - \varepsilon, \varepsilon)$. In our experiment, subjects were allowed to make offers up to the second decimal digit, so $\varepsilon = 0.01$ for all p. If players are other-regarding consequentialist, as in FS, the equilibrium allocation in our extended UG depends on the distribution of α and β in the population, and will entail a more favourable allocation to the receiver than in the SPNE. However, since preferences only depend on final outcomes, and lotteries do not affect such outcomes, the results of lottery $L2$ should be entirely irrilevant. In sum, individuals who are *consequentialist*, be they self-interested or other-regarding (see section 2) should behave in the same way across our treatments. The same holds for individuals concerned with intention-based reciprocity or efficiency. Only procedural players should react to our treatment manipulations.

Subjects played the game described above anonymously for 20 rounds with random re-matching at the beginning of each round. Payoffs were given by the outcomes of two randomly-selected rounds out of the 20. Random payments were done partly to limit income effects as the play went on, partly to minimise the profitability of dynamic strategic behaviour such as rejecting with higher frequency in the early stages of the game to induce counterparts to offer more at later stages. We preferred to pay subjects for the outcomes of two rounds instead of just one because we feared that a payment based on only one round, coupled with the relatively low show-up fee (£5), may have discouraged receivers from rejecting unfair offers. After each round each pair was informed of the outcome of the interaction. No information about the outcome of the other pairs' interactions was instead released. The experiment instructions are reported in the SOM.

First, we want to test for the hypothesis that a given offer is more acceptable when it has been generated within a game where players had fairer initial chances. If condition 2 holds, then we should observe higher acceptance rates in treatments where $L2$ is less biased against the unfavored player. This is also in line with the survey results reported in section 1. The higher the belief that the playing field is level, the more acceptable is inequality. We thus posit a "Monotonic Fairness Hypothesis":

H_1: The higher p, the higher receivers' acceptance rates for a given split.

Whilst BBO compare only two extremely different lotteries in their second study, our setting enables us to study a finer range of distribution of chances within lotteries. We are particularly interested in testing for Nozick's (1994) prediction that individuals are highly sensitive to the symbolic value of actions. Nozick argues that individuals attach value to the possibility of expressing their own individuality through actions, where this power of expression magnifies the utility intrinsic to the action. As Nozick (1994, 27-28) puts it: "Having a symbolic meaning, the actions are treated as having the utility of what they symbolically mean." Furthermore, Nozick (1994, 34) argues that the individual's value metric over the probability space may not be linear, and may suffer "discontinuities" in the origin of the space, i.e.

when we move from full certainty to even limited uncertainty: “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.” Accordingly, our conjecture is that the act of making an offer with only a 1% chance of it being relevant, may symbolize, for the unfavored player, expressive value independently of the intrinsic expected utility coming from having this option. This power of "voice" (Anand, 1991; see also discussion in section 5) may give the individual what Nozick calls an "expressiveness", that is, a source of "value" that goes beyond the mere utility associated with the act itself.

We thus posit a "Symbolic Opportunity Hypothesis":

H_2: Receivers' acceptance rate decreases significantly in the 0% treatments in comparison to the 1% treatments.

We are also interested in testing for the impact of varying the allocation of opportunities over time. In VRCTs players' assignment to the favored or unfavored position was redrawn before each round, while in FRCTs the initial assignment remained fixed throughout the 20 rounds. The different interaction dynamics in the two sets of treatments is represented in Figure 2.

INSERT FIGURE 2 ABOUT HERE

In FRCTs $L1$ is run only once at the beginning of the experiment, and then 20 $L2s$ are run in each round. In VRCTs, both $L1$ and $L2$ are run in each round. We argue that VRCTs can be deemed as more procedurally fair than FRCTs. In Appendix A we provide a formal proof for the following statements. First, unfavored players in the FRC have strictly fewer expected opportunities than favored players to access the proposer role, whereas favored and unfavored players have the same expected opportunities in the VRC. Second, VRC unfavored players enjoy strictly higher expected opportunities than FRC unfavored players involved in *corresponding treatments*. We define corresponding treatments the pairs of FRCTs and VRCTs whose $L2$ is characterized by the same probability p. There are three pairs of corresponding treatments, which we denote p_VRC and p_FRC, $p \in P \equiv \{0\%, 1\%, 20\%\}$. Third, if we take an *ex ante* perspective and look at the whole game before the start of the first round, even if opportunities in the VRC and the FRC have the same expected value, nevertheless their *variance* is strictly higher in the FRC than in the VRC. In FRC the outcome of the initial - and only - role assignment is extremely unequal - i.e. one player is favoured (unfavoured) for all 20 rounds. Conversely, in VRCTs opportunities are much more evenly distributed, with the most likely outcome being that a player is advantaged half of the times. Although we do not develop this argument in this paper, it is quite plausible that individuals react to the variance with which opportunities are distributed as well as its expected value.

Consistently with the considerations above, we expect that procedural individuals will be sensitive to the procedural difference between the FRC and the VRC. We thus posit a "Dynamic Opportunities Hypothesis":

H_3: For any corresponding treatment, receivers' acceptance rate decreases significantly in p_FRC as compared with p_VRC, $p \in P$.

In this paper we focus on receivers' behavior. The analysis of proposers' behavior is reported in the SOM. There we show that proposers' patterns of behavior mirror receivers' behavior. This is not surprising, especially in a context of repeated interactions, because it is very likely that proposers conditioned their strategies upon the behavior they observed from receivers to maximize their payoffs. However, in the SOM we also show that proposers were able to predict perfectly the differences in receivers' behavior across treatments in the first round of the game (see SOM, section 2). In the paper we only examine proposers' behaviour descriptively to assess the overall inequality of the interactions across the various treatments.

Experiments were conducted with a sample of 426 Warwick University undergraduate students, using a between-subject approach. Further details of the experimental procedures are reported in the SOM.

4 Results

4.1 Results for FRCTs

4.1.1 Descriptive Analysis

Table 1 reports descriptive statistics for proposers and receivers' behaviour in each treatment. First, we note that overall acceptance rate in the *0%_FRC* treatment is 77.58%, while the mean proposers' demand is equal to 62.8%. This is largely in line with other UGs[6]. The *0%_FRC* is the treatment in our experiment that is closest to standard UGs, so we have some assurance that our results are not due to specific idiosyncrasies of our sample. Comparing the 50% treatment (Table 1a) and the FRCTs (Tables 1 b-d) brings out the existence of a monotonic pattern consistent with H_1 and H_2. As the bias of the initial lottery increases, both the mean and the median values of rejected demands decrease (see Tables 1a-d, Columns 1). This means that as the

[6] In their meta-analysis, Oosterbeek *et al.* (2004) report that the weighted average acceptance rate from 66 UG studies is 84.25%, whereas average demands equal 59.5% of the pie in 75 UG experiments.

initial lottery becomes more biased, receivers request larger shares of the pie to accept an offer.

INSERT TABLE 1 ABOUT HERE

Second, the acceptance rates of low offers decreases as the bias of the initial lottery increases (see Tables 1a-d, Columns 3). Consistently with much of the literature, we consider an offer as "low" when the proposer offers 20% or less to the receiver. The drop in the acceptance rate for high demands is particularly pronounced between *1%_FRC* and *0%_FRC,* consistently with H_2. This monotonic pattern does not emerge in overall acceptance rate, but this is likely due to the variation in the magnitudes of offers across treatments. The econometric analysis of the next section controls for this aspect. Similar patterns are found for proposers' behaviour. As the initial lottery becomes more biased, both the mean and median offers of favored proposers follow a decreasing pattern (see Tables 1a-d, Columns 4). The frequency of high demands decreases with the bias of the initial lottery. The same monotonic pattern emerges between *20%_FRC* and *1%_FRC* with respect to non-favored proposers (see Tables 1b-c, 1e-f, Columns 5).

Figure 1 in the SOM offers a graphical representation of receivers and proposers' behavior in each treatment by reporting histograms of demands as well as acceptance rates for different classes of demands. Acceptance rates tend to decrease within each class as the initial lottery becomes more biased. The distribution of demands tends to become more skewed towards the left as the chances of the unfavored player decrease.

4.1.2 Econometric Analysis

We pool all observations coming from FRCTs and the *50%* treatment together. We model the repeated nature of the data with a random-effects model. This is a common method to analyse experimental data coming from repeated interactions (see e.g. Dickinson, 2000; Armantier, 2006). However, it is plausible that as interactions went on, subjects updated their beliefs over receivers' minimum acceptable offer on the basis of the feedback received, and modified their offers accordingly. If there is such a learning effect, it is interesting to investigate the first round separately. However, our results of the first round alone do not deviate substantially from our overall results (see SOM, section 2). Hence, here (as well as in the VRC) we report only the analysis of pooled obseravations.

Given the dichotomic nature of the receiver's variable, we fit the following logit models:

$$\begin{aligned} ACCEPTANCE_{i,t} &= \alpha_i + \tau CHANCE + \gamma_{i,t} OFFER + \\ &+ \delta_{i,t} FAVORED + \theta_t ROUND_t + \lambda_i Z_i + u_i + \varepsilon_{i,t} \end{aligned} \tag{3}$$

$$\begin{aligned} ACCEPTANCE_{i,t} &= \alpha_i + \beta_j TREATMENT_j + \gamma_{i,t} OFFER + \\ &+ \delta_{i,t} FAVORED + \theta_t ROUND_t + \lambda_i Z_i + u_i + \varepsilon_{i,t} \end{aligned} \tag{4}$$

The dependent variable is the dichotomic variable $ACCEPTANCE$ - where 1 (0) denotes acceptance (rejection) of a given offer. In model 3, *CHANCE* takes the value of p, that is, the probability for an unfavored player to become the proposer. *CHANCE* thus offers a continuous measure of the bias in the initial lottery. We control for the size of the offer assigned to the receiver through the variable *OFFER*. The dummy variable *FAVORED* identifies the interactions where a subject being in the favored role was later drawn as receiver of the game. Obviously this only applies to the *1%* and the

20% treatments. Subjects initially drawn as favored may have formed higher earnings expectations for that particular round than if they were drawn as unfavored, thus increasing the likelyhood of rejection. On the other hand, favored players may have taken into account that they were overall more likely to occupy the proposer role, thus being able to aspire to higher payoffs across the experiment (see Statement 1, Appendix A). Such fairness concerns may make them *more* lenient in accepting offers when occupying the receiver role. $ROUND$ dummies are also included to control for time trend effects or effects associated with specific rounds. Finally, u_i and $\varepsilon_{i,t}$ are individual-specific and observation-specific error terms. The indexes i and t denote the individual and the round of the interaction, respectively. Note that all regressors are exogenous. Hence, the individual-specific effects α_i must be uncorrelated with the other regressors, thus ensuring that a between estimator is consistent. To check for the robustness of our results, we also consider another specification where some individual demographic characteristics are included in the model through the vector Z_i. The inclusion of Z_i entails a considerable loss of observations, so we present both the results with and without Z_i. Model (4) keeps the same specification as model (3) apart from replacing *CHANCE* with dummy variables identifying individual treatments - named $TREATMENT$. The *50%* treatment is the baseline. This enables us to study the differential effects of pairs of treatments on propensity to accept, thus testing directly H_2 as well as performing a more stringent test of H_1.

Regression results are reported in Table 2. *CHANCE* has a strong and positive effect ($P < 0.001$), thus supporting H_1 (Table 2, Column 1). Receivers clearly reacted to procedural fairness in the initial lottery, and were more likely to accept offers when these came after a less unbiased initial lottery. As expected, $OFFER$ has a positive and strong effect ($P < 0.001$). $FAVORED$ also has a positive sign ($P = 0.037$). Favored subjects were more likely to accept offers when drawn as receivers than unfavored subjects. This gives support to the idea that their motivations may be affected by the assessment of overall fairness across the whole interaction (see above). These results are virtually unchanged even after controlling for individual characteristics (Table 2, Column 2). Attending Economics degrees significantly increased probability of acceptance ($P = 0.026$). Women were significantly more inclined to accept offers than men ($P = 0.040$). UK students were significantly more likely to accept offers, *ceteris paribus,* than foreigners ($P = 0.029$). Age did not exert significant effects.

Figure 3a reports the probabilities of acceptance in each treatment for various offers, as predicted by model (4), omitting Z_i (see Table 2, Column 3). The diagram shows that for any offer, as the bias of the initial lottery decreases, the probability of acceptance increases. Probabilities are close to 0 (1) for the lowest (highest) offer considered. For the other intermediate offer values, sizable differences emerge across treatments. For instance, for offers equal to 20% of the pie, the predicted probability of acceptance is equal to 0.92 in the baseline case, drops to 0.85 in the 20%_FRC and to 0.69 in the 1%_FRC, and drops to a mere 0.17 in the 0%_FRC. Differences appear to be particularly pronounced comparing the 0%_FRC vis-à-vis other treatments, but are considerable in other treatments, too.

INSERT FIGURE 3 ABOUT HERE

Results of two-tailed Wald tests over treatment differences are reported in Table 4a. The null hypothesis is H_0: $\beta_k - \beta_l = 0$ against H_1: $\beta_k - \beta_l \neq 0$, for each pair of $TREATMENT$ coefficients. Note that a positive (negative) sign for the z-statistic means that the probability of acceptance was higher (lower) in treatment k (row entry) than in treatment l (column entry). Table 4a supports hypothesis H_2 of a symbolic value of opportunity. The difference between $\beta_{0\%\_FRC}$ and $\beta_{1\%\_FRC}$ is negative and significant ($P = 0.017$). Receivers in $1\%\_FRC$ had, *ceteris paribus,* a significantly higher probability of accepting a given offer than receivers in the $0\%\_FRC$ Hence, an assignment of even minimal opportunities seems to matter a great deal for FRC receivers. All the signs in Table 4a are negative and thus in line with H_1. Pairwise comparisons are significant in four out of six cases. Results are virtually identical when demographic controls are introduced in the regression (Table 2, column 4).

On the basis of this analysis, we conclude:

Conclusion 1 *Descriptive and econometric analysis supports H_1 in the FRC.*

Conclusion 2 *Descriptive and econometric analysis supports H_2 in the FRC.*

4.2 The Variable Role Condition

4.2.1 Descriptive Analysis

Table 1 shows that the monotonic pattern linking bias in the initial lottery and rejection rates still holds moving from *0%_ VRC* to *20%_ VRC,* but is reversed between *20%_ VRC* and *50%.* Looking at the mean and median values of rejected demands we can infer that receivers' hostility decreases between *0%_ VRC* up to *20%_ VRC,* but it then rises again (see Tables 1a,e-g, Columns 1). A similar trend can be detected with respect to the acceptance rate of low offers (see Tables 1a, e-g, Columns 3). An identical pattern holds for mean and median offers (see Tables 1a,e-g, Columns 4). As far as being favored in the lottery is concerned, a striking difference between VRCTs and FRCTs is that unfavored proposers demand *less (more)* than favored proposers in the former (latter) set of treatments (see Tables 1b-c, Column 5). This is the case for both *20%_ VRC* and *1%_ VRC*[7]. We believe this is due to the different perception of overall fairness in the two sets of treatments. We return to this point in section 5.

Figure 1 in the SOM shows a noticeable drop in acceptance rates for high demands in *0%_ VRC,* whereas acceptance rates remain high (i.e. higher than 80%) for a larger class of offers in the *20%_ VRC* than in other treatments. It also shows that the distribution of offers is more skewed towards the right in the *20%_ VRC* than in the remaining treatments.

4.2.2 Econometric Analysis

We fit models (3) and (4) to analyse receivers' behaviour in VRCTs (see section 4.1.2). Contrary to what occurred for FRCTs, the variable $CHANCE$ is no longer significant (Table 3, column 1). This may be due to the inversion of the monotonic trend between *20%_ VRC* and *50%* that we observed in the descriptive analysis. To check whether H_1 may hold limitedly to a portion of the relevant interval, we add a squared term to $CHANCE$. Both the linear and the quadratic term have indeed significant effects, (Table 3, columns 3). The probability of acceptance reaches a maximum for $CHANCE = 0.27$. Hence, H_1 appears to be supported within a limited region of the interval. Among individual controls, women are again more likely to accept offers ($P = 0.048$), and economic students are more likely to accept offers ($P = 0.040$), while UK citizenship is no longer significant (Table 3, column 2 and 4). Even in this case, demographic controls do not affect the main results of the analysis.

[7] According to Mann-Whitney tests, the difference between offers by favored and unfavored players is statistically significant in both *20%_ FRC* ($P < 0.001$) and *20%_ VRC* ($P = 0.06$). See also section of the SOM.

Figure 3b depicts the predicted probability of acceptance based on model 4, omitting Z_i (see Table 3, column 5). The main feature of this diagram is that the three treatments $0\%\_VRC$, $1\%\_VRC$, $20\%\_VRC$, do follow a monotonic trend. For instance, for offers equal to 15% of the pie, the predicted probability of acceptance is equal to 0.45 in the 0%_VRCT, it rises to 0.74 in the $1\%\_VRC$, and to 0.90 in $20\%\_VRC$. However, the probability of acceptance drops to 0.72 in *50%*.

Pairwise comparisons of treatment coefficient differences confirm the existence of a non-linearity in how receivers reacted to variations in p (see Table 4b). H_1 appears to be supported limitedly to the three treatments *0%_ VRC, 1%_ VRC,* and *20%_ VRC.* All the signs of the z-statistics are negative and statistically significant. As far as H_2 of a symbolic value of opportunity is concerned, the Wald test rejects the null hypothesis that treatment dummies are equal in *0%_ VRC* and *1%_ VRC*, albeit at weak levels of significance ($P = 0.063$).

We conclude:

Conclusion 3 *Descriptive and econometric analysis supports H_1 in the VRC only limitedly to* $0\%\_VRC$ *through* 20%_ *VRCTs. The monotonic pattern breaks between* $20\%\_VRC$ *and* 50%.

Conclusion 4 *Descriptive and econometric analysis weakly supports H_2.*

4.3 Comparing the VRC and the FRC

First, we note that descriptive statistics from Table 1 support H_3. For each pair of corresponding treatments (see section 3), the mean and median value of rejected demands, and the acceptance rate of high demands, are all lower in FRCTs than VRCTs.

We fit the econometric model (4) to all pooled data. The results of the regression are reported in the SOM. Table 5 reports the results of Wald tests conducted over pairs of coefficient differences. Acceptance rates are *ceteris paribus* significantly lower in FRCTs than in VRCTs in all corresponding treatments. The difference is highly significant between *0%_FRC* vis-à-vis *0%_ VRC* ($P = 0.002$), and significant between *20%_FRC* vis-à-vis *20%_ VRC* ($P = 0.012$), and *1%_FRC* vis-à-vis *1%_ VRC* ($P = 0.033$). As shown in the SOM, offers were significantly lower in FRCTs than VRCTs, too. We thus conclude:

Conclusion 5 *Descriptive and econometric analyses support* H_3*.*

As far as efficiency is concerned, Figure 4a shows that this is generally higher in VRCTs than in other treatments. The overall acceptance rates is the inverse of the output gone lost because of the "conflict" between receivers and proposers. The two treatments where losses were *lowest* were *20%_ VRC* and *0%_ VRC*, with an overall acceptance rate of 85%. *20%_FRC* comes third, and *50%* is only fourth in this ranking, with an acceptance rate of 81%. The treatments with highest efficiency losses were *1%_FRC* and *0%_FRC.* The same occurs in the last five rounds of the game (See Figure 4b).

5 Discussion and Conclusions

The following conclusions can be drawn from the present study. First, we find robust support for the Monotonic Fairness Hypothesis in FRCTs. The greater the inequality in the distribution of initial opportunities, the lower the acceptance rates of a given offer. Consequently, average offers increase. This pattern of behaviour reproduces the insights coming from survey analysis that the more a society is deemed as granting fair opportunities to their citizens, the lower the demand for redistribution (see section 1). In VRCTs we instead find an inverted-U pattern. Overall, it is striking that manipulations of initial opportunities which should leave a consequentialist individual indifferent seem to matter a great deal to individuals. Although several other studies have emphasised the relevance of procedural fairness, all of them have studied procedures affecting final outcomes. Our study is the first studying purely random procedures modifying access to the initial position of an interaction. We can conclude that procedural fairness seems to matter at the beginning of the history of an interaction, not just at its very end.

Second, we find clear support for the Symbolic Opportunity Hypothesis. In both FRCTs and VRCTs, receivers act significantly more leniently after having been previously assigned a mere 1% initial chance of acting as proposers compared to having no chance. We believe that ours is the first study finding such a clear variation in behaviour associated with such a small modification of chances in an experimental context. Handgraaf *et al.* (2004), and Suleiman (1996), find some significant changes in behavioural patterns between the "corner" and the interior of the interval scale they considered. However, their setting manipulates players' outside options in UGs, so their result is not due to procedural fairness, but rather to modifications in final payoffs.

Our study validates experimentally other empirical and survey evidence regarding the importance of "voice" for people. Frey and Stutzer (2005) find support for the thesis that the mere right to participate in the political process - rather than actual participation - increases individual satisfaction - a phenomenon they refer to as "procedural utility". Anand (2001) reports survey evidence supporting the importance people place on having the right to have their opinion heard - or appropriately represented - in collective decision processes. The relevance of this right to voice may be caused by the desire to express one's position, or to obtain respect for one's worth.

As a matter of fact, in our experiments we are not able to disentangle whether such a result is due to the purely procedural aspect of having a say in the collective decision problem, or to the actual allocation of a 1% chance of acquiring the advantaged position. Discriminating between these two interpretations would call for the running of a treatment where subjects have a 0% chance of having their offer submitted, but are nonetheless asked to submit an offer[8]. In other words, the symbolic value of opportunity may matter for individuals in a purely representative way, even if it is not attached to any chance - as small as it may be - of influencing the assignment of positions.

Third, we find support for the Dynamic Opportunities Hypothesis. Acceptance rates are significantly higher in VRCTs than FRCTs, and as a consequence, proposers' demands are also higher. As argued in section 3, this is consistent with our claim that subjects see VRCTs as a fairer procedure by which to allocate initial opportunities. It appears that players are prepared to accept even extreme levels of opportunity inequality within each round, in exchange for overall equality of opportunity across the whole series of interactions.

The break of monotonicity we observe in VRCTs (see section 4.2) is undoubtedly surprising. This is associated with each VRC treatment having lower conflictuality rates - and thus greater efficiency - than the baseline case of equal opportunities. These results are arguably worth more investigation. It may be the case that VRCTs simply made more salient to subjects the possibility of achieving some *form* of fairness, albeit in a dynamic rather than in

[8]We thank Tim Salmon for this suggestion.

a static sense, thus inducing subjects to become more lenient over proposed allocations[9]. However, our findings may point to something more substantial. One hypothesis that is worth examining in future research is whether creating "spheres" of relative advantage of opportunity is conducive to a public endorsement as potent as that of granting equal opportunities under all circumstances. For instance, affirmative action has been criticised as a measure for redressing unfairly distributed initial opportunities on the grounds that it grants an *unfair* advantage to some groups of normally disadvantaged people. In other words, it engenders a situation of *reverse discrimination* (see e.g. Sher, 1984). Our results stress that, on the contrary, people may perceive favourably the allocation of preferential advantage to some people in some domains, even when the degree of favouritism is very high. Admittedly, this occurs within a context of *overall* equality of opportunity, thus it may not generalise to other contexts.

It is also striking that most of the observed variation in behaviour takes place as we move from the 0% treatment to the 1% treatment. When $L2$ is unbiased, receivers reject on average offers of £2.15, and when $L2$ gives people no chances of being a proposer in the FRC, receivers reject on average offers of £2.96. Put it in a different way, receivers would be available to pay on average $81p$ - the difference between £2.96 and £2.15 - to be in

[9] In Grimalda, Kar, Proto (2012), we speculate that this result may be due to the establishment of a "convention", legitimising favored players to demand larger shares of the pie than what we observe in the *50%* treatment. A "convention" has been defined as a situation in which players use an exogenously given characteristic of an interaction - such as the random assignement to one of two colours - to solve a co-ordination problem (Hargreaves-Heap and Vaourofakis, 2002). In our case, players may have used the assignment to the favored role in the random draw as a characteristic enabling them to demand a larger share of the pie - thus acting more "hawkishly" - whereas players being assigned the unfavored role accepted with higher frequency such demands - thus acting more "dove-like" - in comparison with FRCTs. The behavior of unfavored VRC (FRC) proposers, who demand significantly *less* (*more*) than their favored counterparts, seems to be consistent with this conjecture (see section 4.2.1). The absence of any role salience in the 50% treatment may have prevented the emergence of any convention.

the 50% treatment rather than being in $0\%\_FRC$. By the same token, receivers would be available to pay $43p$ to have a 1% chance of being proposers compared to none, and only $38p$ more to have equal chances compared to a 1% chance. In other words, the "demand for opportunity" seems to be very steep near the origin of the scale, but considerably less so afterwards. The intuition coming from our study is that people are particularly sensitive to having at least *a* chance of achieving advantaged positions. Perhaps due to over-optimism or other types of distortions of one's actual chances, people end up magnifying the actual relevance of such chance. Clearly much more needs to be investigated to understand the extent of this effect. With all the due caution that is needed when extending experimental results to policy issues, at the very least we believe that our research indicates that individuals' endorsement of the fairness of opportunity distribution may not be as clear-cut as one may think.

We believe that our results also point to the existence of some heterogeneity of behaviour with respect to procedural fairness. On the one hand, the observation that VRCTs considerably differ from FRCTs indicates that players attach relevance to the running of $L1$, because this is the only feature differentiating the two sets of treatments (see Figure 2). On the other hand, we can also conjecture that for a considerable number of players the running of $L1$ must have been *irrelevant.* This can be brought out focusing on VRCTs. If we take an *ex ante* perspective, that is, if we place ourselves *before* $L1$ has been run, then the distribution of the random variable defining future opportunities is the same for every VRCT, whatever the round that has been reached (see the proof of Statement 3 in Appendix A). Models that use either expected payoffs (Trautmann, 2009; Krawczyk, 2010), or p - the probability of "success" in each round (Karni and Safra, 2002; our own model)-, to measure procedural fairness, predict, in this perspective, that behaviour should be the same across VRCTs. The observation of clear variations between VRCTs, in our view, may be accounted for by conjecturing that some individuals "forget" $L1$, and only take into account $L2$.They thus react to the differences in the bias of the latter.

The idea that experimental subjects "forget" the even assignment to roles in the initial lottery is not a new insight. This has been used to account for, e.g., the other-regarding behavior of Dictators in DGs, and has received support in a specifically designed study (Shurter and Wilson, 2009). In sum, our results point to the possibility that different groups of players have different "cutoff points" in how much of the past history counts for their current choice. Self-serving biases may obviously be relevant, too, in the choice of where to place one's cutoff point. In spite of the speculative character of our conjectures, we believe our findings call for more empirical analysis on the extent to which having had fair chances in the past affects the assessment of the fairness of the current decision.

Finally, we believe that an open question in the literature is the assessment of the relative importance of procedural fairness vis-à-vis individual merit, responsibility, or needs, in acquiring certain positions. Existing evidence seems to give an edge to individual merit or responsibility over procedural fairness when the two are considered jointly. For instance, Anand (2001) reports situations - such as health care decisions - where random lotteries are deemed as *unfair* by survey respondents (see Keren and Teigen, 2010 for a comprehensive study) . However, we believe that the available evidence is still too limited to draw any firm conclusion. More in-depth research on the role and the interplay among the various components of an individual's sense of justice is, to be sure, needed to shed light on these issues.

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A Propositions on dynamic procedural fair-

ness

Let the variable $X(k)$, $k = \{1, \ldots, 20\}$ be the random variable defining the number of times a player becomes proposer in any round r from k onwards, $r = \{k, \ldots, 20\}$. The expected value of $X(k)$, $E(X(k))$, is an obvious indicator of the opportunities a player can expect from round k of the interaction onwards to access the advantaged bargaining position.

It is straightforward to prove the following propositions:

Proposition 1 *In FRCTs, the difference in $E(X(k))$ between favored and unfavored players is positive and proportional to $(1 - 2p)$, whereas it is equal to 0 in VRCTs. This holds for any $k > 1$.*

Proof. Suppose an agent is about to play the k-th round of the stage game. Let us take an *ex ante* perspective, that is, in VRCTs $L1$ is yet to take place. In p_FRC, $L1$ has instead already taken place in Round 1 and a player knows her role. If the player is favored in p_FRC, then her distribution of $X(k)$ follows $Bin(21-k, 1-p)$. This is the case because each lottery is independent, and the favored player is assigned the proposer role with probability $1 - p$. Similarly an unfavored player faces a distribution $Bin(21 - k, p)$. Conversely, in VRCTs $X(k)$ follows $Bin(21 - k, 1/2)$ for both types of players. This is the case because in each VRC round players are first faced with $L1$ that is an even lottery, and later with $L2$ that assigns the proposer role with probability p if favored and $(1 - p)$ if unfavored. Considering this compound lottery, the probability that a VRCT player is assigned the proposer role is thus $1/2(p) + 1/2(1 - p) = 1/2$. Thus, for any FRCT, $E(X(k))^{FAV} - E(X(k))^{UNFAV} = (21-k)(1-p) - (21-k)p = (21 - k)(1 - 2p) > 0$ because $p < 1/2$. Conversely, for any VRCT, $E(X(k))^{FAV}$-$E(X(k))^{UNFAV} = (21 - k)1/2 - (21 - k)1/2 = 0$ QED. ■

Thus, unfavored players suffer a clear disadvantage in expected opportunity vis-à-vis favored players in any FRCTs, whereas this is not the case in VRCTs. The case of $k = 1$ is analyzed in Proposition 3.

Let us now compare the perspective of two unfavored players in corresponding treatments (see section 3). In the current round these two players are faced with the same probability of accessing the proposer role. However, it is easy to show the following:

Proposition 2 $E(X(k+1))$ *is greater for a VRCT unfavored player compared to an FRCT unfavored player. This holds for any pair of corresponding treatment and for any* $k < 20$.

Proof. Suppose that an agent is about to play the k-th round of the stage game. Let us now take an ex post perspective. That is, in both p_VRC and p_FRC, $L1$ has already been run. Let us take pairs of corresponding treatments, and let us consider a player who is unfavored at the k-th round of p_VRC. Her situation is exactly the same as an unfavored player of p_FRC for the k-th round. But afterwards she faces a distribution of $X(k)$ that is $Bin(20-k, 0.5)$, whereas an unfavored player in p_FRC faces $Bin(20-k, p)$. Since the expected value of the former (latter) distribution is $(20-k)1/2$ $((20-k)p)$, and $p < 1/2$, a currently unfavored player in p_VRC has more chances to occupy the proposer role in the future than an unfavored player in FRC. QED ■

In other words, VRCTs unfavored player have higher expected opportunities compared to FRCTs unfavored players over the course of the experiment.

One may object that opportunities are as fairly distributed in FRCTs as in VRCTs, because before the initial role assignment each player had an even chance of being assigned the advantaged position. In fact, if we consider

$k = 1$ and we take an *ex ante* perspective, that is, before L1 has been run, $E(X(20)$ is indeed the same for any player. Nevertheless, we believe that a a plausible assumption is that individuals are not only sensitive to the expected value of $X(k)$, but also to its variance. Let us call $Var(X(k))$ the variance of $X(k)$. We can prove the following:

Proposition 3 *$Var(X(20))$ in FRCTs is greater than $Var(X(20))$ in VRCTs for any pair of FRC and VRC treatments.*

Proof. Let us consider players' prospects when k=1 and no $L1$ has yet been run. The distribution of $X(20)$ is thus as follows: in any p_VRC, $X(20)$ follows $Bin(20, 0.5)$, thus $E(X(20)) = 10$, $Var(X(20)) = 20p(1-p) = 5$. In p_FRC, $X(20)$ follows $\{Bin(20, p)$ with prob 0.5, $Bin(20, 1-p)$ with prob 0.5$\}$. Hence, $E(X(20)) = 10$, $Var(X(20)) = 0.5[n(n-1)[p^2 + (1-p)^2] + n] - 0.25n^2$, where $n = 20$. Note that if $p = 0.5$ in the latter formula, $Var(X(20)) = 5$, exactly the same as $Var(X(20))$ under p_VRC. If we differentiate the variance expression with respect to p, we obtain $0.5n(n-1)[4p-2]$, which is lower than 0 for all $p < 0.5$. Since the second derivative is positive for all p, $p = 1/2$ is a point of minimum. Thus the variance expression is decreasing in p, for all $p < 0.5$. Thus $V(X(20))$ under $p\_FRC > V(X(20))$ under p_VRC. QED ■

B Applying our theoretical model to our dataset:

In this section we draw on the utility function put forward in section 2 to account for two of our findings: *i*) *ceteris paribus*, a decrease in inequality of opportunity - that is, an increase in p - increases the probability of acceptance of an offer and *ii*) an increase in p increases the inequality of the allocation.

Following FS, we assume that the proposer does not know the exact value of the envy factor of the receiver, but knows that it is distributed according to some distribution function $F_p(\alpha)$. The equivalent of a 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}. For simplicity we set $\beta_i = 0$.

Suppose j is the proposer and i is the receiver. Recall from section 2 that x_i and x_j denote agent i and j's shares, respectively, so $x_i + x_j = 1$. 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 an offer if and only if $[x_i - \alpha_i(x_j - x_i)] \geq 0$, or, equivalently, $\alpha_i \leq \frac{x_i}{1-2x_i}$. 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 distributions:

$$f_p(t) = \begin{cases} \lambda e^{-\lambda(t-a(p))} & \text{if } t \geq a(p) \\ 0 & \text{otherwise} \end{cases} \tag{6}$$

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

$$\frac{F_{p_1}\left(\frac{x_i}{1-2x_i}\right)}{f_{p_1}\left(\frac{x_i}{1-2x_i}\right)} \geq \frac{F_{p_2}\left(\frac{x_i}{1-2x_i}\right)}{f_{p_2}\left(\frac{x_i}{1-2x_i}\right)} \tag{7}$$

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

$$x_i(p) = \{\min x_i | x_i \text{ satisfies Equation 5}\} \tag{8}$$

Thus for all $x_i < \ x_i(p_1)$, we have $\frac{(1-x_i)}{(1-2x_i)^2} > \frac{F_{p_1}\left(\frac{x_i}{1-2x_i}\right)}{f_{p_1}\left(\frac{x_i}{1-2x_i}\right)}$. By Equation 7, $\frac{(1-x_i)}{(1-2x_i)^2} > \frac{F_{p_2}\left(\frac{x_i}{1-2x_i}\right)}{f_{p_2}\left(\frac{x_i}{1-2x_i}\right)}$ 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 (see section 4) we observe a jump from $p = 0$ to $p = 0.01$. This can be accommodated in our post-hoc model if we assume that there is a jump from F_0 to F_p for any $p > 0$. This is consistent with the Symbolic Opportunity Hypothesis illustrated in section 3.

C Acknowledgements

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FIGURES/TABLES MAIN TEXT

Figure 1: **Game tree of the basic interaction**

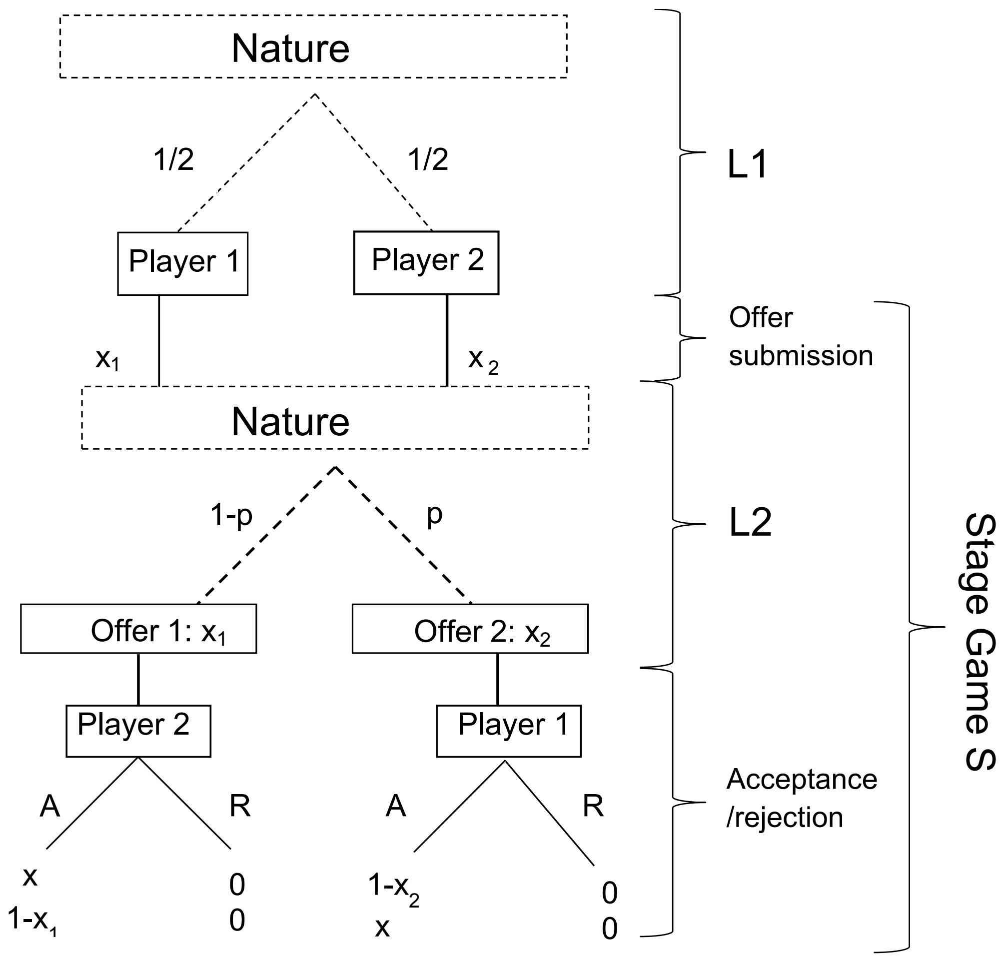


Figure 2: Experiment Interaction Dynamics

	Round 1	Round k, k={2, 19}	Round 20
FRC	L1+S	S	S
VRC	L1+S	L1+S	L1+S

Table 1: Descriptive statistics of receivers and proposers' behavior per treatment

Table 1a: 50%

	Responses			Demands	
	(1)	(2)	(3)	(4)	(5)
	RD	AR (All)	AR (Low)	FAV	UNF
Mean	7.85	81.45%	53.7%	6.97	
St. Dev	0.85	0.39	0.50	1.07	
Median	8			7.00	
Obs	115	620	134	1240	

Table 1b:FRC 20%

	Responses			Demands	
	(1)	(2)	(3)	(4)	(5)
	RD	AR (All)	AR (Low)	FAV	UNF
Mean	7.61	84.03%	52.7%	6.89	7.17
St. Dev	0.75	0.37	0.50	0.82	1.09
Median	7.6			7.00	7.20
Obs	99	620	91	620	620

Table 1e: VRC 20%

	Responses			Demands	
	(1)	(2)	(3)	(4)	(5)
	RD	AR (All)	AR (Low)	FAV	UNF
Mean	8.39	85%	66.6%	7.37	7.13
St. Dev	0.75	0.36	0 .47	0.98	1.40
Median	8.4			7.50	7.50
Obs	90	600	225	600	600

Table 1c:FRC 1%

	Responses			Demands	
	(1)	(2)	(3)	(4)	(5)
	RD	AR (All)	AR (Low)	FAV	UNF
Mean	7.47	78.91%	46.9%	6.77	6.62
St. Dev	0.71	0.41	0 .50	0.88	1.77
Median	7.5			6.99	6.75
Obs	135	640	66	640	640

Table 1f: VRC 1%

	Responses			Demands	
	(1)	(2)	(3)	(4)	(5)
	RD	AR (All)	AR (Low)	FAV	UNF
Mean	7.97	81.07%	51.4%	7.20	6.87
St. Dev	0.78	0.39	0 .50	0.90	1.79
Median	8			7.00	7.00
Obs	106	560	134	560	560

Table 1d:FRC 0%

	Responses			Demands	
	(1)	(2)	(3)	(4)	(5)
	RD	AR (All)	AR (Low)	FAV	UNF
Mean	7.04	77.58%	21.7%	6.28	
St. Dev	0.71	0.42	0.42	0.91	
Median	7			6.17	
Obs	139	620	23	620	

Table 1g: VRC 0%

	Responses			Demands	
	(1)	(2)	(3)	(4)	(5)
	RD	AR (All)	AR (Low)	FAV	UNF
Mean	7.56	85%	47.1%	6.56	
St. Dev	0.91	0.36	0.50	1.07	
Median	7.33			6.50	
Obs	90	600	70	600	

Note: RD= Rejected demands; AR (All) =Acceptance Rate with respect to all offers; AR (Low) =Acceptance Rate with respect to low offers (less or equal to 20% of the pie); FAV=Favored; UNF=Unfavored.

Table 2: Regression Analysis of Logit model for probability of acceptance – *50%* treatment & FRC treatments

DEP VAR	ACCEPT			
	(1)	(2)	(3)	(4)
CHANCE	5.872***	6.695***		
	(1.552)	(1.878)		
FRC_20%			-0.782	-1.438
			(0.898)	(1.025)
FRC_1%			-1.735**	-1.788*
			(0.882)	(1.003)
FRC_0%			-4.114***	-4.819***
			(0.919)	(1.068)
OFFER	3.425***	3.525***	3.438***	3.545***
	(0.214)	(0.237)	(0.214)	(0.238)
FAVOURED	1.870**	1.666*	1.061	1.173
	(0.897)	(0.934)	(1.062)	(1.069)
ECONOMICS		1.757**		1.858**
		(0.786)		(0.765)
YEAR		-0.0654		-0.0405
		(0.203)		(0.196)
GENDER		1.512**		1.438**
		(0.737)		(0.717)
UK		1.646**		1.559**
		(0.752)		(0.726)
Constant	-7.422***	118.8	-4.751***	72.50
	(0.831)	(402.5)	(0.779)	(388.7)
ROUND DUMMIES	YES	YES	YES	YES
Observations	2,500	2,165	2,500	2,165
Number of individuals	189	159	189	159
Chi2	264.7	227.5	265.8	228.8
Percentage of correct predicted outcomes	81.9%	82.7%	81.7%	82.5%

Notes: Dependent variable equals 1 if accepted, 0 if rejected (see Table 1 for descriptive statistics). Numbers in parentheses are standard errors. Round dummies have been included in all regressions. Stars denote significance levels as follows: * = P-value<0.1; ** = P-value<0.05; *** = P-value<0.01. Predicted outcomes are computed from the model predicted probability of acceptance by assigning a predicted outcome of acceptance (rejection) whenever the predicted probability is greater (smaller or equal) to 0.5. So a predicted outcome is correct when it matches the actual decision of the subject, i.e. when the subject accepted (rejected) an offer and the model predicted a probability greater (smaller or equal) than 0.5.

Table 3: Regression Analysis of Logit model for probability of acceptance – *50%* treatment & VRC treatments

DEP VAR	ACCEPT					
	(1)	(2)	(3)	(4)	(5)	(6)
CHANCE	1.245	2.615*	15.11***	14.33**		
	(1.199)	(1.587)	(4.837)	(6.787)		
CHANCE SQUARED			-27.85***	-23.83*		
			(9.391)	(13.37)		
VRC_20%					1.274*	0.691
					(0.654)	(0.942)
VRC_1%					0.108	-0.776
					(0.654)	(0.844)
VRC_0%					-1.134*	-1.589*
					(0.657)	(0.902)
OFFER	2.845***	3.043***	2.861***	3.049***	2.880***	3.061***
	(0.188)	(0.253)	(0.188)	(0.252)	(0.189)	(0.253)
FAVOURED	0.263	0.402	0.0704	0.248	0.0746	0.250
	(0.443)	(0.659)	(0.454)	(0.672)	(0.454)	(0.672)
ECO		1.365**		1.401**		1.400**
		(0.666)		(0.658)		(0.654)
YEAR		0.368		0.279		0.257
		(0.229)		(0.230)		(0.230)
GENDER		1.301**		1.185*		1.127*
		(0.659)		(0.651)		(0.650)
UK		0.124		0.132		0.160
		(0.648)		(0.638)		(0.635)
Constant	-4.839***	-738.8	-5.378***	-561.6	-4.836***	-517.7
	(0.662)	(454.8)	(0.688)	(456.7)	(0.716)	(456.4)
ROUND DUMMIES	YES	YES	YES	YES	YES	YES
Observations	2380	1610	2380	1610	2380	1610
N_g	238	161	238	161	238	161
chi2	236.1	153.1	239.8	154.3	241.3	154.9
Percentage of correctly predicted outcomes	84.2%	85.6%	84.6%	86%	84.3%	85.7%

Note: See Table 2.

Figure 3: Predicted probability of acceptance applied to 50% and FRCTs (Panel a) and 50% and VRCTs (Panel b)

Figure 3a: 50% and FRCTs

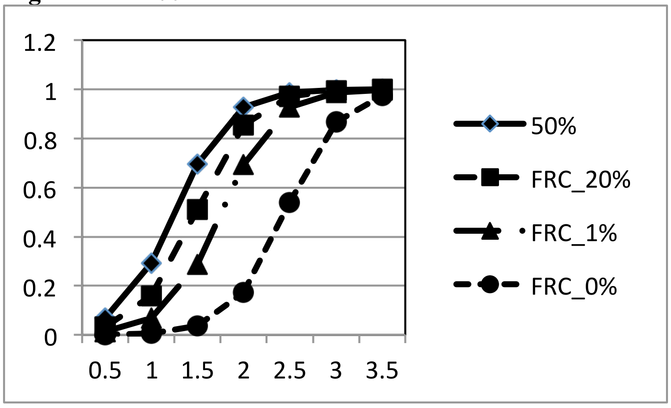
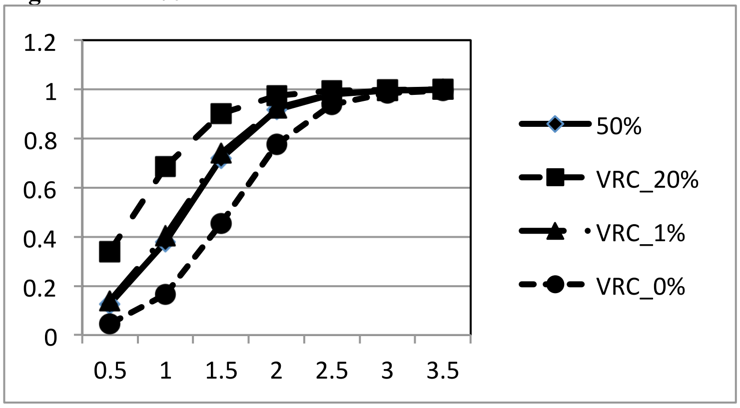


Figure 3b: 50% and VRCTs



Note: Predicted probabilities for Figure 3a (3b) have been derived from the logit model (4) applied to 50% and FRCTs (50% and VRCTs)- see Table 2, column 3 (Table 3, column 5). ROUND has been set equal to the last interaction, and FAVOURED is set at the mean value of the sample. The horizontal axis reports point values for offers ranging from 5% to 35% of the pie. The estimated probability of acceptance for each treatment is reported on the vertical axis.

Table 4: Results of Wald test relative to econometric analyses for probability of acceptance in 50% and FRCTs (Panel a) and 50% and VRCTs (Panel b)

Table 4a: Results of Wald test relative to 50% and FRCTs

FRC ACCEPTANCES ALL ROUNDS			
	50%	20%	1%
20%	-0.87		
	(0.384)		
1%	-1.97**	-0.97	
	(0.049)	*(0.330)*	
0%	-4.48***	-3.28***	-2.39**
	(0.000)	*(0.001)*	*(0.017)*

Table 4b: Results of Wald test relative to 50% and VRCTs

VRC ACCEPTANCES ALL ROUNDS			
	50%	20%	1%
20%	1.95*		
	(0.051)		
1%	0.17	-1.76*	
	(0.869)	*(0.078)*	
0%	-1.73*	-3.56***	-1.86*
	(0.084)	*(0.000)*	*(0.063)*

Note: Tables 4a (4b) report z-statistics and p-values relative to Wald tests for the hypothesis Ho: β_k-β_l=0 against H_1: β_k-$\beta_l \neq 0$. β_k and β_l are the coefficients of treatment dummies determined in the specification of Table 2, column 3 (for Table 4a)- and in the specification of Table 3, column 5 (for Table 4b). Rejections of H_0 at the 10% / 5% / 1% is denoted by one, two or three stars respectively.

Table 5: Results of Wald test relative to differences in acceptance rates between FRCTs and VRCTs

		VRC ACCEPTANCE		
		20%	1%	0%
FRC ACCEPTANCE	20%	-2.52**		
		(0.012)		
	1%		-2.13**	
			(0.033)	
	0%			-3.14***
				(0.002)

Note: See Table 4. The econometric specification from which the tests are drawn is reported in the SOM, Table 9, column 1.

Figure 4: Distribution of pie per treatment: All rounds (Panel a) and last five rounds (Panel b)