On the Fairness of Random Procedures

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Abstract

We consider procedures that use randomness to make a decision that involves several individuals. We asked subjects to compare the fairness of six pairs of seemingly equivalent procedures. We propose a classification of subjects into two categories: those who are "emotional" in the sense that they exhibit a systematic ranking of procedures on the basis of intuitive notions of fairness, and those who are "consequentialists" in the sense that they systematically view each pair of procedures as being equally fair. According to this classification, about 30% of the subjects are emotional while 31% are consequentialists

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1. Introduction

Randomization is a common feature of decision-making procedures that affect a group of individuals. When discriminating between individuals is necessary and in the absence of clear criteria for doing so, randomness is often used as a device for making a “fair” choice (for example, see Fienberg (1971) and Broom (1984)). The use of random procedures dates back to the Bible, which viewed them not only as means for avoiding disputes (“The lot causeth disputes to cease, and it decideth between the mighty”, Proverbs 18:18), but also as a manifestation of divine intervention (“The lot is cast into the lap, but its every decision is from the Lord”, Proverbs 16:33). In modern times, random selection was used, for example, in drafting soldiers during the Vietnam war, in jury selection, the allocation of places in charter schools and the allocation of public housing.

Random choice procedures that generate the same distribution over outcomes are often not perceived as being equally fair. For example, consider the following two procedures: According to procedure A, a single individual is randomly chosen to make the group’s choice. According to procedure B, all the individuals in the group simultaneously write their choice on pieces of paper and one is chosen randomly to determine the group’s collective choice. The two procedures seem equivalent. In procedure B, as in procedure A, each agent "should" make the choice as if he were the decisive agent. However, there is a common perception that procedure B is somehow fairer. This is because it allows all individuals to “actively participate” and it avoids having a single individual perceived as bearing the sole responsibility for the outcome.

In this short paper, we demonstrate that procedures involving randomization, which seem equivalent, may be perceived as being different in terms of fairness. We report the results of a survey in which subjects were presented with six pairs of seemingly equivalent procedures and were asked to compare them with respect to fairness (indifferences were allowed). For each pair, consisting of two alternative ways of randomizing in a particular scenario, there are intuitive reasons why the two procedures may not be perceived as being equally fair. Based on the results for four of the six problems (where the intuitive reasons tend to favor a single

alternative) we suggest a classification of subjects according to the following two types:

- The "consequentialist" type who considers a pair of equivalent procedures to be equally fair, and
- The "emotional" type who considers the "intuitively" fairer procedure to be fairer.

We then consider the predictive power of this classification in the other two problems.

Identifying the principles underlying procedural fairness is an old research agenda (see, for example, Rawls (1971) and Lind and Tyler (1988)). The approach of using surveys to study attitudes towards fairness and distributive justice was pioneered by Yaari and Bar-Hillel (1984). The question of fairness of equivalent random choice procedures was first discussed in Keren and Teigen (2010).

We do not adhere to particular comprehensive theory of fairness. We simply report the findings that are consistent with the following criteria for the fairness of a choice procedure:
C1: It is fair to treat all individuals equally ex-ante.
C2: It is fair to allow all individuals to actively participate in the procedure whatever the realization of the random elements.
C3: It is fair to delay any asymmetry in the treatment of participants to as late a stage as possible in the procedure.
C4: It is fair to reduce the psychological burden associated with the perception that the individual who executes a random device bears some responsibility for its outcome.
C5: It is fair to use “conventional”/“familiar” means of randomization.
C6: It is fair to respect “divine providence” as manifested in the realization of the random device.

2. The Problems

Subjects were asked to respond to six problems presented in random order. Each problem consisted of two procedures, which are essentially equivalent. They then had to complete the following sentence: "In your opinion, from the point of view of [an entity indicated in bold letters]": (1) Procedure A is fairer than B (denoted by A), (2) Procedure B is fairer than A (denoted by B) or (3) Both procedures are equally fair (denoted by $A \sim B$).

The participants consisted of students in various countries who had taken or are taking an undergraduate course in game theory and had agreed to participate in experiments outside the class framework. They were sent an e-mail containing a link to a questionnaire (see http://gametheory.tau.ac.il/kf12/). 677 subjects from 58 countries completed all six problems, with the vast majority (79%) from from the following 14 countries: USA (21%), Slovak Republic (8%), Columbia (7%), Argentina, Germany and Switzerland (5% each), Finland, Israel, Spain and UK (4% each) and China, Chile, Denmark and Italy (3% each). The male/female ratio was 68%:32%. Two randomly chosen subjects received a prize of $50 for participating.

Following are the six problems:

P1 ("randomly pivotal")

Consider a committee of 15 members that needs to decide by majority vote whether or not to fire some employee. Simultaneously, each committee member puts his name and his vote in a sealed envelope. The committee chair collects the envelopes and meets in private with the employee. Compare the fairness (from the point of view of the committee members) of the following two procedures for communicating the decision to the employee.

A) The committee chair opens the envelopes in private and counts the votes. He announces the outcome of the vote to the candidate and shows him the content of each envelope in some random order.

B) The committee chair opens the envelopes in some random order in front of the candidate. For each opened envelope he announces the name of the committee member and his vote. When at some point, a majority of votes is reached the chair announces the outcome and continues to open the remaining envelopes.

Note that subjects were asked to evaluate fairness from the point of view of the *committee members* and *not* that of the employee. The subjects were again reminded of this in the box where they were to mark their answer. Thus, concerns about early versus late resolution of uncertainty (in the spirit of Kreps and Porteus (1978)) were immaterial for fairness ranking from the point of view of the committee members.

Procedure A is intuitively fairer than B since in B one of the committee members appears to be responsible for the firing decision, in violation of C1. The results are consistent with our

intuition:

A	B	$A \sim B$
56%	18%	26%

P2 (“random dictatorship”)

You are a student in a class that needs to select one of two exam dates. Compare the fairness (from the point of view of the students) of the following procedures for making the decision.

A) One of the students is selected at random and is asked to make the choice. His identity will be announced and his decision will determine the outcome.

B) Each student has to submit a note bearing his name and his choice. One of the notes will be randomly picked; the identity of the student will be announced and his choice will determine the outcome.

The two procedures are versions of the "random dictator" which Gibbard (1977) showed to be the only social choice rule satisfying strategy-proofness, ex ante efficiency, neutrality and unanimity. Heyd (2000) argued that the merit of the random dictator procedure is that it provides the members of the minority, who are ”suppressed” in the majority rule system, with a say, though he did not make a distinction between the two procedures described above.

Both procedures treat all individuals equally ex-ante and thus satisfy C1, while Criterion C2 is satisfied by procedure A but not by procedure B. Hence, procedure *B* is more likely to be viewed as fairer. The results support this:

A	B	$A \sim B$
5%	52%	43%

P3 (“implicit or explicit randomization”)

Consider an employer who needs to fire at most one worker who failed some qualification exam. All workers have taken the exam, some passed some failed. Compare the fairness (from the point of view of the workers) of the following procedures for selecting the worker to be fired.

A) The employer reviews the list of exam results at a random order. The first worker to fail the exam is fired.

B) The employer selects a worker at random from among all the workers who failed the exam.

This problem is related to experiment 9 in Keren and Teigen (2010). They asked subjects to rank four types of random procedures for deciding which patient will receive treatment. Their findings indicate a tendency to view a coin toss as fairer than procedures such as drawing a piece of paper out of a hat or randomly choosing one of the rooms in which each patient is waiting.

Both procedures satisfy C1 and C2 but differ with respect to C3, which requires that all individuals involved should be on an equal footing for long as possible. Ex ante, each worker who failed the exam has the same chance of being fired. In addition, all workers actively participate in the procedure by taking the exam. Both procedures have two stages: In A, the random element is activated first and then the exams are marked; In B, all exams are marked and then the random element is realized. Thus, our intuition is that B will be viewed as fairer than A and this is confirmed by the results:

A	B	$A \sim B$
6%	40%	54%

P4 (“The doctor or the mother”)

Suppose two twins need to receive a kidney transplant from their mother. The mother can donate only one kidney. Compare the fairness (from the point of view of the mother) of the following two procedures for determining who will receive the kidney.

A) The doctor will toss a coin.

B) The mother will toss the coin.

If the mother tosses the coin, she will bear a higher psychological burden than the doctor as a result of denying a kidney to one of her children. Hence, according to C4, A is fairer than B. Our findings suggest that this is how many of the participants viewed the situation:

A	B	$A \sim B$
31%	10%	58%

P5 (“the ‘drawn’ or the ‘not drawn’”)

Imagine there are two equally qualified candidates for a position, both of whom reached

the final stage of the recruiting process. The name of each candidate is put in a sealed envelope. One of the envelopes will be randomly drawn. Compare the fairness (from the point of view of the candidates) of the following two procedures for selecting the candidate to be hired.

A) The candidate whose name is drawn is hired.

B) The candidate whose name is not drawn is hired.

A appears to be fairer according to two fairness criteria. First, it is conventional that the person whose name is drawn is awarded the "prize". Hence, by C5, A is fairer than B. Second, the first name drawn is perceived as chosen according to "God's will" ("this individual was destined to win"). Hence, *not* selecting that individual may be viewed as going against "God's will" (C6). Our findings are consistent with the ranking suggested by C5 and C6, although the effect is a weak one:

A	*B*	*A* ~ *B*
14%	2%	84%

P6 ("drawn twice")

One prize is to be awarded to one person from among 20 candidates. Compare the fairness (from the point of view of the candidates) of the following procedures for selecting who will get the prize.

A) A computer program repeatedly draws a name at random, and the prize is awarded to the first person whose name is drawn twice.

B) A computer program draws one of the names at random and that person is awarded the prize.

There are two conflicting criteria in this case. On the one hand, the fact that the same name appears twice is an indication that it is "God's will" and thus according to C6 procedure A is fairer. On the other hand, procedure A allows for candidates to be drawn once but not to be selected in the end, which may be viewed as going against "God's will" and thus, according to C6 procedure B is fairer. This conflict between criteria is evident in the results:

A	*B*	*A* ~ *B*
21%	23%	56%

3. Are there "types" of individuals?

A natural question is whether the data points to the existence of "types", i.e., systematic patterns in responses that characterize significant proportions of the participants. The proposed typology is based on only the first four questions. This is because 84% of the subjects in P5 considered both procedures to be equally fair and no unique procedure was perceived as being fairer than the other in P6. The following two types are suggested:

Consequentialist - Of the 81 possible profiles of answers, we labeled as "consequentialist" the nine profiles that included at least three indifferences. About 31% of the subjects fall into this category. Of those 209 subjects, 40% displayed four indifferences and 39% displayed three, with none of them in P1.

Emotional - In the cases that a participant was not indifferent, he was most likely to choose A in P1, B in P2, B in P3 and A in P4. Thus, a subject is labeled as "emotional" if in the first four questions he deviated from (A,B,B,A) in one answer or not at all. About 30% of all participants were classified as emotional and 25% of them chose exactly (A,B,B,A).

The 63 profiles of answers that are classified as neither consequenialist nor emotional account for 78% of all possible profiles; however, they were chosen by only 39% of the subjects. Each of these 63 profiles was exhibited by at most 6% of all subjects.

Basing the definitions of the two types on only the first four problems makes it possible to test whether they provide good predictions of the answers to the last two problems. We hypothesize that a consequentialist participant is more likely to view the two procedures as equally fair than an emotional participant. The data confirms this hypothesis:

P5	Emotional	Consequentialist
A	26%	3%
B	3%	0%
A ~ *B*	71%	97%

P6	Emotional	Consequentialist
A	30%	9%
B	30%	12%
A ~ *B*	40%	79%

4. Discussion

Gender. The distribution of "consequentialist" and "emotional" types by gender is consistent with the stereotype that women are more emotional:

type	emotional	Consequentialist
m	26%	34%
f	37%	24%

In all six problems more males declared the two procedures to be equally fair:

Problem	1	2	3	4	5	6
m	30%	45%	57%	60%	85%	60%
f	21%	39%	44%	56%	81%	46%

Incidentally, the gender differences were smallest for the question involving the mother tossing a coin.

Order position. As mentioned above, the problems were presented to each subject in random order. Interestingly, the proportion of indifferences did not increase as the questionnaire progressed and even declined somewhat. Thus, indifferences declined from 56% in the first three questions presented, to 52% in the fourth and fifth and 50% in the last. The following table compares the distribution when all data is considered (the "All" column) to that when the problem appeared first in the sequence (the "First" column):

	P1		**P2**		**P3**		**P4**		**P5**		**P6**	
	First	**All**	**First**	**All**	**First**	**All**	**First**	**All**	**First**	**All**	**First**	**All**
A	52%	56%	9%	5%	9%	6%	35%	32%	14%	14%	15%	21%
B	20%	18%	45%	52%	29%	40%	8%	10%	5%	2%	24%	23%
A~B	28%	27%	46%	43%	62%	53%	57%	58%	81%	84%	61%	56%

As can be seen, there are differences between the two columns for all six problems, but these differences are relatively small.

Geography. The widely dispersed distribution of participants by country does not allow us to make any meaningful country-based comparison. Only six countries are represented by more than 30 participants and there do not appear to be any striking differences in the distribution of answers across these six populations.

Response time. Rubinstein (2007) demonstrated how subjects' response time may be used to classify their answers to a particular problem as either "instinctive" or "cognitive". Following this approach we compared for each problem the mean response time of subjects who were indifferent between the two procedures to that of subjects who viewed one procedure - the one most likely to be viewed as fairer (A in P1, B in P2, C in P3, A in P4, A in P5 and B in P6) - as fairer. However, we did not find any significant differences. This suggests that subjects who did not find any difference in the fairness of two procedures were not any less attentive to the problem as subjects who did find a difference.

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