SOCIAL SCIENCES

It's not just how the game is played, it's whether you win or lose

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Growing disparities of income and wealth have prompted extensive survey research to measure the effects on public beliefs about the causes and fairness of economic inequality. However, observational data confound responses to unequal outcomes with highly correlated inequality of opportunity. This study uses a novel experiment to disentangle the effects of unequal outcomes and unequal opportunities on cognitive, normative, and affective responses. Participants were randomly assigned to positions with unequal opportunities for success. Results showed that both winners and losers were less likely to view the outcomes as fair or attributable to skill as the level of redistribution increased, but this effect of redistribution was stronger for winners. Moreover, winners were generally more likely to believe that the game was fair, even when the playing field was most heavily tilted in their favor. In short, it's not just how the game is played, it's also whether you win or lose.

INTRODUCTION

The steep increase in economic inequality has raised growing concerns about the effects on political polarization, support for policies designed to promote economic redistribution and economic growth (*1*–*5*), social mobility (*6*–*8*), equality of opportunity (*9*–*12*), and social cohesion (*13*). Survey research has shown that economic inequality is deemed unacceptable when it is perceived as the outcome of an uneven playing field (*9*, *12*, *14*, *15*).

While previous research has convincingly demonstrated a close association among normative conceptions of fairness, cognitive explanatory beliefs, and individual attainment, the causal dynamics are difficult to parse using observational data, for two reasons. First, previous research has operationalized fairness using respondents' beliefs about the causes of inequality. For example, in a 2011 study, Alesina and Giuliano (*4*) measured "a (possibly vague) sense of what is 'fair' and 'unfair' by whether people feel that there is a difference between wealth accumulated, for instance, by playing the roulette tables in Las Vegas and wealth accumulated by working one's way up from an entry-level job to a higher-level one with effort, long days at the office and short hours of sleep." In another study, Alesina and La Ferrara (*2*) measured "'fair' versus 'unfair' differences in opportunities (e.g., whether family wealth matters, or it matters whom you know, etc.)." Similarly, Isaksson and Lindskog (*16*) measured "an input based concept of fairness [...] captured by the effect of beliefs about the causes of income differences." Second, the causal direction runs both ways: disproportionate shares of income and wealth also confer unequal opportunities that amplify further differences in rewards and resources, a phenomenon referred to as "cumulative advantage" (*17*, *18*) and crystallized as the "Great Gatsby curve" (*6*). This circularity confounds observational studies of the effects of unequal opportunity on beliefs about the fairness of unequal outcomes. The conundrum is deepened because information about the processes that generate unequal outcomes is complex and difficult to access, with the consequence that people instead rely on biased perceptions of personal experience and ideologically motivated partisan narratives (*19*, *20*).

We unpacked the causal puzzle using an experiment that fixes the level of outcome inequality while exogenously manipulating the distribution of opportunities that lead to unequal outcomes. The experiment complements findings from survey research by prioritizing internal over external validity, and we therefore caution against generalizing the results to actual economic inequality. However, randomized trials make it possible to tease out the effects of unequal opportunity and unequal outcomes, which is not possible in observational studies. The results contribute to our understanding of differences in perceptions of fairness and attributions of success between those who stand to gain and those who stand to lose from social policies that alter economic opportunities (*21*–*24*).

We are not the first to use experiments to study the effects of inequality on perceptions of fairness. Previous experiments show that respondents are more likely to accept unequal economic outcomes if they perceive those outcomes as the consequence of talent and effort (*21*, *25*–*27*). We also extend previous experimental research on the psychological determinants of fairness perceptions. Research on attribution error demonstrates a tendency to explain personal success as the result of intrinsic properties such as ability and effort while pointing to external factors (e.g., unequal opportunity or misfortune) to make sense of failures (*28*–*31*).

Research in economics has documented the effect of self-serving bias on fairness perceptions (*32*, *33*) and on preferences for redistribution (*26*, *33*, *34*). Studies of social preferences in distributional games show how the economically successful tend to overstate the role of talent, while unsuccessful individuals point to external circumstances (*25*, *26*, *35*).

Our study also compares the responses of winners and losers but with the innovation that we manipulate equality of opportunity independently of outcomes, skill, and effort, thereby shifting the focus from psychological to structural influences on perceptions of fairness. We use a novel experimental design to disentangle the causal effect of two sources of inequality on (i) cognitive beliefs about attributions of success to internal versus external factors; (ii) normative beliefs about fairness of the outcomes; and (iii) affective responses regarding satisfaction with the outcome. We find that winners are more likely than losers to deem outcome inequality as

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fair, perceive talent as its most important factor, and express positive emotions, regardless of the underlying rules that govern the distribution of outcomes.

The structure of the paper is as follows. We first detail our research design by introducing the Swap Game, an online experiment, and then explain our key manipulations of opportunity and luck, present our results, and conclude.

Research design

The experiment consists of a simple two-person seven-round card game, "the Swap Game" (see the "Online implementation" section in the Supplementary Materials for details). Following a short training session (described in the next section), two participants are randomly assigned to structurally unequal positions as player 1 (P1) or player 2 (P2). P1 is randomly assigned at the beginning of the game, and that player remains P1 for all seven rounds. At the beginning of each round, each player is dealt nine cards that cannot be seen by the other player. P1 starts each round by playing any card, which is then removed from P1's hand. P2 must then play a card that is higher than the one played by P1, where all four suits have equal value. If P2 has no higher card, then P2 "passes." P1 then plays another card. If P2 has a higher card, then P2 plays that card and it is removed from P2's hand. P1 must then play a card that is higher than that of P2 and so on, until one player has no more cards and becomes the winner of that round.

Round 2 then begins and the players are again dealt nine cards and play proceeds exactly as in round 1, except that the players must first swap up to two cards. In the progressive exchange (PR), the winner of the previous round must exchange the strongest card(s) while the loser exchanges the weakest. In the regressive exchange (RE), winners of the previous round swap their weakest card(s) and losers exchange their strongest. RE creates a Matthew effect, making previous winners more likely to win again. PR is compensatory redistribution, making winners less likely to win again, similar to rules used to promote league parity in some professional sports. In the baseline exchange condition (RA), the players exchange cards that are randomly chosen. This "placebo" maintains procedural equivalence with the PR and RE conditions but has zero redistributive effect on the strength of the hand.

Following the exchange, players are shown the cards that they sent and received. The game continues for a total of seven rounds, after which the player who won the most rounds is declared the winner. The players see a short stack of coins for the loser and a large stack for the winner, labeled with the amounts ($2.50 and $7.50, respectively).

After completing the game, the players were administered a short post-treatment survey consisting of three items. These items (listed in Materials and Methods) measure normative beliefs about the fairness of the game, cognitive beliefs about the causes of inequality, and affective responses related to satisfaction with the outcome. The cognitive item asked participants to indicate the most and the least important factors that determine the game outcome: luck, skill, or the rules of the game. The choices were presented as mutually exclusive so that participants who chose "rules of game" over "luck" could only be referring to the rules governing the exchange of cards and not to advantages conferred by luck (i.e., being chosen as P1 or P2 or the "luck of the draw" in the cards that were dealt). The normative item asked participants to judge the outcome as fair or unfair, and the affective item asked participants to indicate their satisfaction with the outcome, choosing between emoticons for happiness, indifference, sadness, and anger.

The survey concluded with a series of standard sociodemographic items. The normative and cognitive items and their choices were randomly ordered to avoid learning effects, but the affective item was always asked after the first two to avoid confounding whether the participant's response (e.g., "happy face" or "sad face") indicated that they enjoyed (or were bored by) the game or were satisfied/dissatisfied with the outcomes of the exchange rules. By placing the affective item after the cognitive and normative items, the item is framed as a response to the experimental manipulations.

Manipulation of opportunity and luck

The Swap Game minimizes the intrinsic effects of skill and effort by removing the need for strategic decision-making. The only choice that players make is which card to play, and players learn in the training session before the experiment that they should always lead with their highest card (which maximizes the odds that the opponent will have to pass, allowing the player to then play their next highest card, and so on). The training session consisted of three rounds played against a simulated opponent, using rules identical to those in effect for the actual game. This simulated opponent always played the highest card. All players were given the same cards to play in the three training rounds and played against the same simulated opponent. Thus, any differences in performance in the training rounds could only reflect differences in skill, attention, and effort. However, no differences were found nor did we find that winners in the training session were more likely to win in the actual game, indicating that winning in the training session did not confer a performance advantage that might confound the effects of our experimental manipulations (see fig. S3 and the "The role of individual skills" section in the Supplementary Materials).

Removing dependence on skill is necessary to rule out the possibility that a participant's attribution to skill has a basis in fact. The experiment tests whether participants will attribute unequal outcomes to differences in skill even in a contest in which skill plays little or no role. Instead of skill, the game is heavily dependent on the effects of luck and the rules of exchange (see the "Luck and the redistribution of opportunity" section in the Supplementary Materials). Luck affects the opportunity to win by conferring both a structural advantage and a material advantage.

The structural advantage is the random designation as P1, who enjoys the opportunity to initiate each of the seven rounds by discarding any card, without the need to play only a card that is higher than the opponent's (see the "The player ID effect" section in the Supplementary Materials). The material advantage is the luck of the draw that gives one player a stronger hand. The higher the values of a player's cards, the greater the opportunity to win—a literal implementation of the familiar aphorism that a successful individual was "dealt a great hand" because of the advantages of birth, gender, or ethnicity.

In addition to luck, outcomes also depend on the "redistribution of opportunity." Although the term "redistribution" is generally used to refer to the leveling of economic outcomes via transfers and taxes, redistribution in the Swap Game operates not on outcomes but on opportunities to obtain those outcomes. Opportunity is redistributed by requiring players to exchange one or two cards at the beginning of each round (except the first). In the RA condition,

opportunity depends maximally on luck in the assignment of player order (structural advantage) and the luck of the draw (material advantage). Relative to the level playing field in the baseline condition, RE and PR tilt the playing field to favor either the winner (RE) or loser (PR) of the previous round.

The card exchange manipulates the level of redistribution and the direction. The level is manipulated by increasing the number of cards that must be exchanged in the PR and RE conditions. The more cards that are exchanged (either one or two), the fewer the cards in the hand that depend only on the luck of the draw and the more that depend on the outcome of the previous round.

In summary, the Swap Game uses a fully crossed design to test for differences between winners and losers in the effect of the redistribution of opportunity on normative beliefs about the fairness of the game, cognitive beliefs about the causes of inequality, and affective responses related to satisfaction with the outcome.

RESULTS

The experiment tests differences between winners and losers in normative (Fig. 1), cognitive (Fig. 2), and emotional responses (Fig. 3) to unequal outcomes, broken down by the direction and level of redistribution of opportunity. Each figure displays results for PR on the left and RE on the right, with the level of redistribution ranging from 0 to 2 on the *x* axis. In the baseline condition (RA), cards are randomly chosen for exchange with no redistributive effect, indicated by 0 redistribution on the *x* axis. As expected, the number of cards exchanged was irrelevant in the random exchange (RA), hence we combined results from the one- and two-card baseline exchanges (see the "Baseline exchange conditions" section in the Supplementary Materials), labeled as 0 redistribution in the figures. All figures show the baseline condition twice, at the lower left of each panel, to facilitate comparisons between conditions. Figures 1 to 3 report 95% credible intervals using Bayesian logistic regression with uninformative priors. Confidence intervals estimated using frequentist statistics confirm that the results are robust to different estimation methods (see the "Credible and confidence intervals" section in the Supplementary Materials).

Normative responses are shown in Fig. 1. The figure reports declining perceptions of fairness as the level of redistribution increases from 0 to 2 in both PR and RE conditions. Winners in the regressive one-card exchange are less likely to regard the outcomes as fair compared to their counterparts in the PR. Compared to losers, winners are twice as likely to perceive the outcome as fair, regardless of the level or direction of redistribution. There is no condition in which losers are more likely than winners to regard outcomes as fair. Losers' perceptions of fairness in the absence of redistribution (the RA) are similar to winners' perceptions of fairness in the two-card RE.

Nevertheless, normative responses indicate a "Warren Buffet effect" as regressive redistribution increases from zero (RA) to two. Although winners have a higher baseline, perceptions of fairness decline more sharply for winners than for losers, indicating that winners' perceptions are more sensitive than those of losers to a system that is rigged in their favor.

In the PR, perceptions of fairness in the one-card exchange are similar to those in the baseline condition but drop to levels observed in the regressive conditions when two cards are exchanged, indicating participants' awareness of the increased importance of the rules of game (see fig. S7). Participants regard a compensatory one-card exchange as fair, but the two-card exchange tilts the playing field too far, even when it is to the benefit of the disadvantaged player.

Cognitive responses are shown in Fig. 2. The figure reports perceptions of the declining importance of talent (Fig. 2A) and luck (Fig. 2B) as the level of redistribution increases from 0 to 2 in both PR and RE conditions, in parallel with the decline in perceptions of fairness in Fig. 1 (see also table S2). Winners generally attribute outcomes to talent more than to luck, while losers are the opposite, but this difference is attenuated when exchanges are progressive. Comparing Figs. 1 and 2, cognitive differences in the responses of winners and losers are not as large as the normative, and their cognitive attributions converge as the level of redistribution increases. In the baseline RA, winners see talent and luck as equally important, while losers attribute outcomes largely to luck. In short, the results indicate that both the level and the direction of redistribution of opportunity are important in shaping participants' cognitive

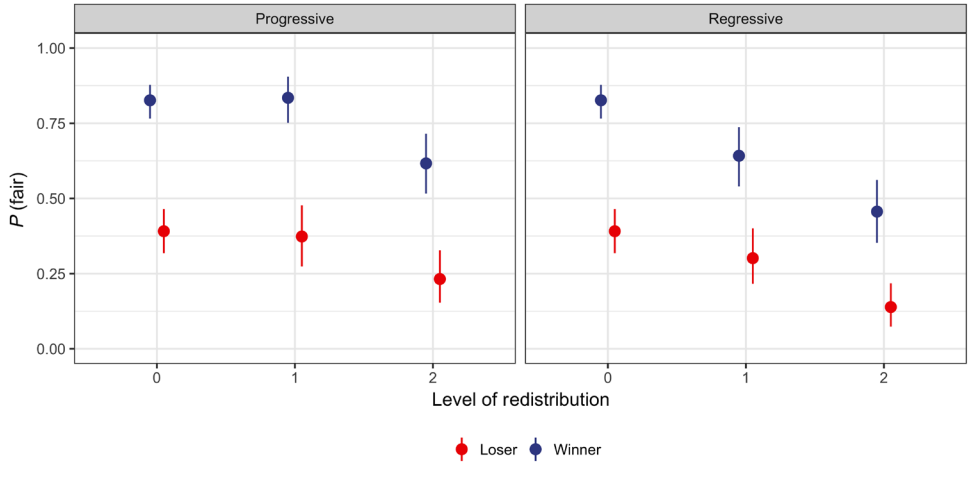

Fig. 1. Proportions of normative beliefs by exchange condition, level of redistribution (0 = random, one-card, and two-card exchange), and outcome as winner (blue) or loser (red). Random exchange (RA) involves zero redistribution and is identical in each panel (indicated by 0 on the *x* axis). Proportions are estimates from Bayesian logistic regression with uninformative priors. Bars are 95% credible intervals with $n = 996$.

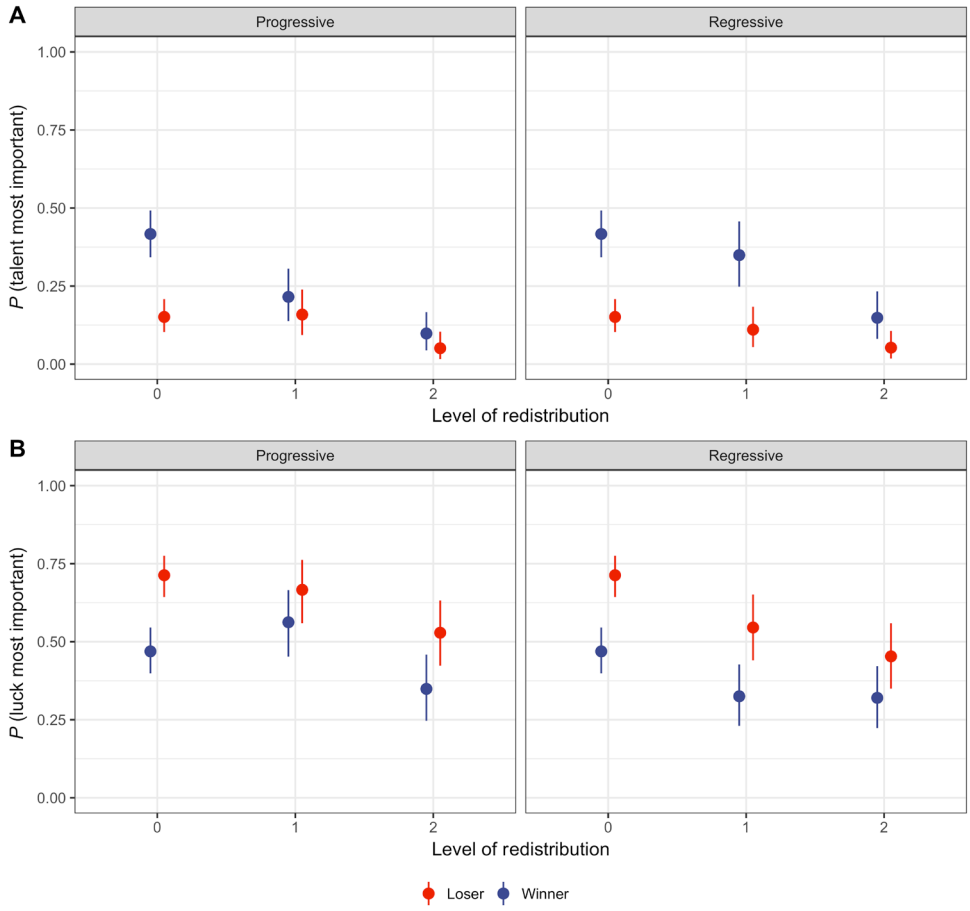

Fig. 2. Proportions of cognitive beliefs (luck and talent) by exchange condition, level of redistribution (0 = random, one-card, and two-card exchange), and outcome as winner (blue) or loser (red). Random exchange (RA) involves zero redistribution and is identical in each panel (indicated by 0 on the *x* axis). Proportions are estimates from Bayesian logistic regression with uninformative priors. Bars are 95% credible intervals with $n = 996$.

responses. On a level playing field, causal attributions to talent versus luck reflect who won, but as the playing field is tilted, participants' responses reflect the tilt more than the outcome, especially in the two-card RE.

Positive and negative affective responses are reported in Fig. 3 (A and B, respectively). Comparison across conditions shows that winners' affective responses are nearly always positive ("happy"), even when they perceive the game as unfair and unrelated to personal talent. Conversely, losers' responses are consistently negative ("sad" and "angry"), whether exchanges are progressive or regressive.

In summary, the Swap Game experiment reveals notable differences in the cognitive, normative, and affective responses of winners and losers. These differences depend, in part, on whether the rules of the game favor winners (in RE) or losers (in PR). However, cognitive and normative differences generally attenuate as redistribution increases from zero to two. In the two-card exchanges, winners and losers differ markedly in normative and emotional responses to unequal outcomes but not in their beliefs about the causes.

DISCUSSION

Survey responses to unequal opportunity and unequal outcomes are generally confounded in studies of attitudes about inequality and distributive justice. This study introduced a novel experimental design that resembles real-life stratification processes in which the distribution of opportunity matters for the distribution of outcomes. We used randomized trials to measure cognitive, normative, and emotional responses to unequal outcomes in a card game in which unequal opportunity could be manipulated independently of other determinants of outcome inequality.

Results showed the largest differences between winners and losers in the RA condition in which opportunity was not redistributed, consistent with research in psychology on attribution error and research in economics on self-serving bias. Winners were more likely than losers to attribute unequal outcomes to talent instead of luck, to see the outcomes as fair, and to express personal satisfaction. As the level of redistribution increased with the number of cards that were exchanged, the normative and affective differences persisted but the cognitive differences disappeared.

The differences between winners and losers were attenuated (but not eliminated) when redistribution tilted the playing field in either direction via PR or RE. Both winners and losers were less likely to view the outcomes as fair or attributable to skill, regardless of who benefited. This result is consistent with other studies showing that higher inequality triggers concerns about equal opportunities (*12*, *36*) and suggests that perceptions of fairness are not entirely

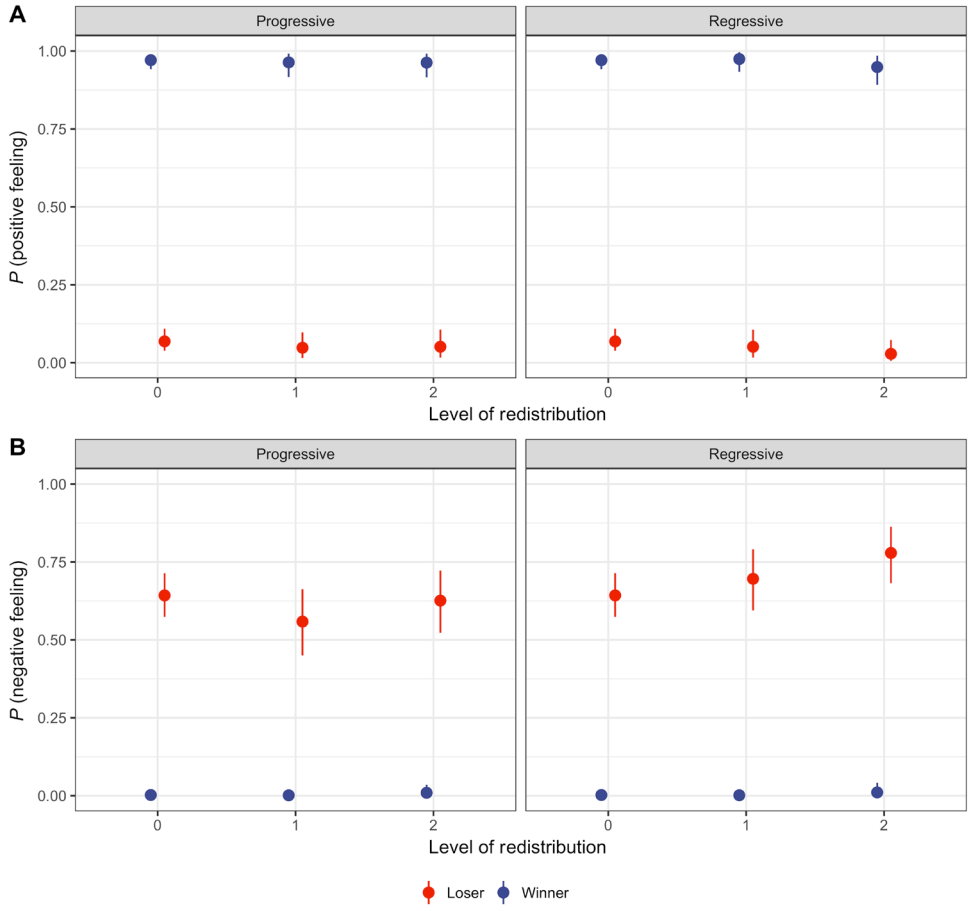

Fig. 3. Affective responses by exchange condition (PR and RE), level of redistribution (0 = random, one-card, and two-card exchange), and outcome as winner (blue) and loser (red). Random exchange (RA) involves zero redistribution and is identical in each panel (indicated by 0 on the *x* axis). Proportions are estimates from Bayesian logistic regression with uninformative priors. Bars are 95% credible intervals with $n = 996$.

motivated by self-interest or by a need to rationalize or justify success and failure. Winners appear to be especially sensitive to regressive redistribution in their perceptions of fairness, reminiscent of repeated calls by Warren Buffet and Bill Gates for higher taxes on the wealthy to level the playing field.

Without further study, we urge caution about generalizing to actual socioeconomic inequality from the results of a card game, for five reasons. First, the redistribution of opportunity through the exchange of high or low cards likely violates implicit norms that games should be played on a level playing field. Further research is needed to test whether these norms extend to real-world economic competition outside the context of a parlor game. By contrast, durable income inequality in real life may dictate fairness norms that should not be impartial and instead directly benefit the materially disadvantaged. Second, we use redistribution to refer to redistribution of opportunities, not of outcomes (via transfers and taxes). Therefore, our findings do not directly generalize to the effects of redistribution of outcomes on beliefs about inequality and fairness. Third, the Swap Game was designed to minimize the effects of skill and effort, and participants were given complete information regarding the rules that govern the distribution of opportunities. In empirical settings, the role of luck is far less transparent and easier to rationalize away (*31*). Fourth, the PR rules differ from real-life progressive conditions such as affirmative action and need-based scholarships, in that progressive redistribution in the experiment does not preclude the first-mover advantage. Last, affective responses may reflect the phrasing of the question, which asks about "your results" rather than "the" results of the game (see Materials and Methods), thereby focusing attention on personal loss or gain, without taking into account the fate of the partner.

These differences notwithstanding, the findings have two potentially important—and contradictory—implications for public support for policies to equalize opportunity, such as affirmative action, investments in early childhood education, and job training. In real-life situations, unequal opportunities often operate in inconspicuous ways—as when a person's income results from an opaque combination of family background, talent, effort, and luck. The increase in the conspicuousness of redistribution as the level of transfer increased from zero (random) to two cards points to what may happen to public opinion as the tilt of the playing field becomes blatantly obvious. As the level of redistribution increased from zero to two, both winners and losers became increasingly likely to see unequal outcomes as unfair and unjustified by differences in talent, whether the rules were regressive or progressive. In the regressive condition, the responses of winners indicate opposition to excessively unequal opportunity, although they are the ones who benefit (the Warren Buffet effect). In the

progressive condition, the responses of losers indicate opposition to excessively redistributive interventions, although they are the ones with the most to gain. In short, the two-card exchanges suggest that responses to unequal opportunity depend on how far the playing field is tilted more than on who benefits from the tilt.

On the other hand, in almost all other conditions (with fewer than two cards exchanged), winners were more likely than losers to see outcomes as attributable to talent, although talent played no role in the game, and across all conditions, including the two-card exchanges, winners were more likely than losers to regard unequal outcomes as fair. Winners were also more likely to express personal satisfaction with the outcomes, even when they perceived the game as unfair and unrelated to talent. In short, beliefs about inequality and fairness seem to reflect "how the game is played" when the rules go too far, but otherwise, what matters most is "whether you win or lose."

MATERIALS AND METHODS

Human participant approval

Our research was reviewed and approved by the Institutional Review Board at Cornell University. The protocol ID no. for this project was 1607006465. Informed consents were collected from all participants.

Dependent variables

The exact framing for our main dependent variables is provided here. For our question about the most (least) important factor, we asked the following: "Please select which of these factors was most (least) important in determining the outcome of the game." The possible answers for these questions were as follows: luck, card-playing skills, and card exchanging. For our fairness question, we asked the following: "Would you say the results of the game were..." for which participants had to select between fair or unfair. In addition to these two options, we allowed participants to explain in words why they selected their answers. As mentioned, both the order in which these three questions appeared to participants and the possible choices within each question were randomized. After these three questions, we also asked participants about their emotional reactions to the outcomes of the game as follows: "How do you feel about your results in the game?" for which they were shown four different emoticons that represented the following emotions: happiness, sadness, indifference, and anger. The arrangement in which these emoticons were presented to participants was also randomized.

Sample characteristics

We conducted our experiment on Amazon Mechanical Turk between 23 August and 25 August 2016. The distribution of participants' sociodemographics is presented in table S8 in the Supplementary Materials.

SUPPLEMENTARY MATERIALS

Supplementary material for this article is available at http://advances.sciencemag.org/cgi/content/full/5/7/eaau1156/DC1

Supplementary Text

Table S1. Sample by outcome, exchange condition, and intensity.

Table S2. Inequality of opportunity by exchange condition.

Table S3. Logistic regression on winning the Swap Game.

Table S4. Proportion of winners by player ID.

Table S5. Proportion of respondents that evaluate the results of the game as fair.

Table S6. Proportion of respondents that mention luck/talent/rules as the most important factor to explain the results of the game.

Table S7. Proportion of respondents that mention positive/negative/indifferent feelings about his/her results in the game.

Table S8. Sociodemographic characteristics.

Table S9. Sociodemographic characteristics by exchange condition.

Fig. S1. Sample instructions for the one-card RE exchange condition.

Fig. S2. Individual hand strength across all rounds for winners (blue) and losers (red) by intensity (columns) and direction (rows) of the exchange condition.

Fig. S3. Predicted probability of winning the game.

Fig. S4. Proportions of normative responses by exchange condition, level of redistribution (0 = random, one-card, and two-card exchange), and outcome as winner (blue) or loser (red).

Fig. S5. Proportions of talent responses as the most important factor by exchange condition, level of redistribution (0 = random, one-card, and two-card exchange), and outcome as winner (blue) or loser (red).

Fig. S6. Proportions of luck responses as the most important factor by exchange condition, level of redistribution (0 = random, one-card, and two-card exchange), and outcome as winner (blue) or loser (red).

Fig. S7. Proportions of rules of the game responses as the most important factor by exchange condition, level of redistribution (0 = random, one-card, and two-card exchange), and outcome as winner (blue) or loser (red).

Fig. S8. Decomposition of the one-card and two-card RA exchange conditions.

Fig. S9. Proportions of the least important factor by winning status, exchange condition, and intensity of redistribution.

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