Room Composition Effects on Risk Taking by Gender

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Abstract

We present evidence of a direct social context effect on decision-making under uncertainty: the gender composition of those in the room when making individual risky decisions significantly alters choices even when the actions or presence of others are not payoff relevant. In our environment, decision makers do not know the choices made by others, nor can they be inferred from the experiment. We find that women become more risk taking as the proportion of men in the room increases, but the behavior of men is unaffected by who is present. This is most consistent with women being aware of the social context and imitating the expected behavior of others. Our results imply that the environment in which individual decisions are made can change expressed preferences and that aggregate behavior may be context dependent. This is important for understanding behavior in organizations as well as how individual decisions may vary across environments.

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1 Introduction

Our decisions and behavior can be strongly influenced by our surroundings. Restaurants understand this and spend a large portion of their operating budget on interior design and hiring staff who add to the ambiance so that customers spend more. Businesses invest heavily in the design of the workplace and placement of workers within the environment to increase productivity. Financial advisers meet clients in their homes, rather than an office, because it cultivates trust and loyalty. Individuals may be more well mannered with a priest or an officer nearby than a friend. Indeed, we can be influenced by who is in our presence, even if others are not affected by our decisions, have no bearing on our choices either now or in the past, and decisions are made in absolute privacy. Social conformity may push us to behave like others to avoid the cost of being different, or the presence of certain people may alter our state of mind, leading us to pursue different goals. Importantly, initial actions may be heavily influenced by the expectation of what others might think making it difficult to know whether a person's behavior causes or is caused by that of others. Understanding whether such effects exist is important because they imply that the mere presence of certain others can affect the choices of individuals. Indeed, the existence of these effects would imply that the composition of teams or even the design of the built environment, which dictates who one is surrounded by, could impact behavior.

Despite its relevance to understanding decision making, there is no direct evidence showing that who is in the room affects behavior, absent strategic interaction, information flow or payoff relevance of others' decisions. We address this by implementing economic experiments that randomly vary the group of individuals in the room in which decisions are made while shutting off any behavioral information and payoff channels.[1] The results are striking. We find that the gender composition of the room in which individual decisions are made alters individual behavior. This effect is large and systematic. Women are willing to choose more risky alternatives as the proportion of men in the room increases, so that when women are surrounded by men, their behavior is statistically indistinguishable. Analysis of our data suggests that the mechanism behind this change in behavior is mainly driven by awareness of social context and conformity.

In our research design, individuals were invited to participate in a laboratory experiment on decision making and were randomly assigned to do so on a particular date and time. After all participants arrived, they were randomly assigned to one of two rooms and a seat within the room. Each room was identical and had four computers arranged around a table in a

[1] Our research design examines the effect of room composition on decisions given that one is in a room with others. We cannot speak to how individuals behave when alone in a room. This is an interesting avenue for future research but is beyond the scope of the current study and data collection.

way that guaranteed privacy of decisions but allowed participants to naturally observe the gender composition of the room. At no point was the composition of the room, or gender, explicitly mentioned.

Participants were asked to make a series of eight decisions which consisted of dividing \$10 between a certain option that paid \$1 per dollar invested and an investment that paid either $\$H$ for $H = \{1.5, 2.0, 2.5, 3.0\}$ with probability one half and $\$L$ for $L = \{-0.5, 0\}$ with probability one half.[2] In three of the decisions, the investment had an expected return below one dollar per dollar invested, in three of the decisions, the investment had an expected return above one, and in two of the decisions the investment had an expected return of exactly one. While all the participants in a room faced the same set of decisions, they faced them in different random orders.

Individual payoffs were based on one of the eight decisions and chance. Importantly, in no way were individual payments affected by the decisions or actions of the other people in the room. In addition, the decision selected for payoff was chosen independently for everyone. One individual could be paid based on a decision with a low return investment while another could be paid based on a high return investment. Finally, all payments were private, so no participant knew what another decided or earned.

By random assignment to the date and time of an experimental session, we minimize the chance that participants know one another in the session or would interact with each other afterwards. This also limits the room composition effects to be driven by unobservables of individuals selecting into a particular day or time. By randomly assigning participants to rooms, we generate different environments based on gender. By asking participants to perform a task that is individual in nature, we eliminate the effect of payoff dependence. By randomizing the order of presentation of decisions, we make it difficult to infer any information on the decisions of others for a particular lottery. Finally, by randomizing the lottery used to calculate payoffs we reduce any meaningful earnings comparisons across participants, should they engage in such cheap talk after the experiment. In our environment, the composition of the room can affect behavior only through some mechanism unrelated to payoff or behavioral information channels.

Our results are as follows. First, consistent with previous research (Croson and Gneezy 2009, Eckel and Grossman 2008b), we confirm that women are more risk averse than men. This holds for all decisions faced by participants and gives us confidence that our data are not atypical. Second, we find that the gender composition of the room has a large effect on the behavior of women, but not on the behavior of men. Female participants become

[2]The design is based on Gneezy and Potters (1997). It is a simple design that requires subjects to make a choice between how much to invest in a risky and safe lottery (Charness et al, 2013).

less risk averse in the company of men. This is true for all decisions, and the effect is large. Female participants amid only men invested more than double the amount invested by female participants amid only women.

The results from our environment are not consistent with expected payoff maximization. Nor are they consistent with status seeking behavior. Women in the presence of men do not make choices that maximize the probability of having the largest payoff in the room. An explanation of behavioral changes associated with women feeling rushed when surrounded by men is not supported.[3] The time taken to make a decision is unaffected by the composition of the room. Another possible explanation is gender identity priming, which is more likely to be triggered when in the minority (McGuire, 1984). This would mean that a woman should behave more like a woman, i.e. more risk aversely, in a room full of men. This is not what we find and is consistent with Benjamin, Choi and Strickland (2010) who find no evidence that direct gender priming affects risk attitudes.

A plausible reason why women become more risk taking when surrounded by men is because they are more aware of the social context and adjust their preferences to mimic the expected behavior of those surrounding them. In the presence of women, they are more risk averse. In the presence of men, they are more risk taking. Women seem to pay attention to who is in the room and conform to the behavior of others.[4] This is consistent with psychology studies which find that women are more likely to conform than men (Bond and Smith 1996), evidence that individuals guess correctly that women behave more risk aversely than men (Eckel and Grossman 2008a) and social comparison theory (Levinger and Schneider, 1969).

Our paper is not the first to experimentally investigate the role of audience or room composition on individual behavior.[5] However, in these studies, the actions of participants

[3]Rubinstein (2007) suggests that choices made instinctively require less response time than those that require cognitive reasoning.

[4]Gender differences in development and behavior appear early in life (McClure 2000, Zahn-Waxler et al. 2008, Baron-Cohen et al. 2005). One of these differences is that girls are better at reading the social environment than boys.

[5]Eckel and Grossman (2001) show that the gender composition of an experimental session affects play in ultimatum games. Gneezy, Niederle and Rustichini (2003) link the composition of a team to participants' behavior in tournaments. Bogan, Just and Dev (2011) show that the gender composition of teams affects giving and the risk decisions of groups. Charness, Rigotti and Rustichini (2007) provide evidence that behavior is affected when individual decisions consequential to the payoffs of others are done privately or publicly. Lindquist and Soderbergh (2011) show that women's willingness to compete in Jeopardy's daily double diminishes if the opponent is a man. Cooper and Rege (2011) provide evidence of peer effects in that information about others' risky decisions affects individual's risky decisions. Rohde and Rohde (2011) also test for peer effects in risky decisions. Ambrus et al (2015) examine aggregation of individual risk preferences into a group decision.

are linked through behavioral information or payoffs channels.[6] Some recent papers have specifically examined the gender composition of groups and risk attitudes. Booth and Nolen (2012) explore the risk-taking choices of adolescent boys and girls in the U.K. Contrary to our study, they find that girls are more risk taking when in same-sex groups. Many reasons might explain the difference between our results, including the age of subjects and that subjects participated in additional tasks with the group members.[7] In another study, women become less risk averse over time in a same-sex class (Booth, Cardona-Sosa and Nolen 2014). The results of these studies are consistent with research on gender differences in competitive attitudes (Gneezy, Niederle and Rustichini 2003, Niederle and Vesterlund 2007), where women are more likely to compete in same-sex groups, and suggest the importance of audience effects and signaling (Bohnet and Frey 1999, Charness, Rigotti and Rustichini 2007, Andreoni and Bernheim 2009). Our results show that when competition, strategic interaction, payoff dependence, previous interactions, feedback and audience effects are not possible, women are less risk averse in the presence of men, not women. Individual behavior is affected by who is seated at the table. The effect is systematic and suggests there is a fundamental mechanism relating individual decisions to expectations on the behavior of others.

There are several implications of our results. Peer effects (Bertrand, Luttmer and Mullainathan 2000, Duflo and Saez 2003, Conley and Udry 2010) might be more basic and influential apart from providing information relevant for economic decisions that is transmitted between group members.[8] Individuals might be affected by how they expect others to behave even if it is not payoff relevant. Indeed, in our experiment, in the presence of men, women increase their investment in lotteries with negative expected payoffs. Also, the results lend support for the idea that some choices may be a reflective reaction to who is in the room. Cooper and Rege (2011) show evidence for informational peer effects in the lab for decisions under risk.

[6]For example, the choices of the other participants directly affect the participant's payoffs (e.g. in bargaining, social dilemma or tournament experiments). The participant's choices affect the other participants' payoffs (e.g. in individual decision making experiments where participants make decisions over own and other's payoffs). The gender composition of the room can affect expectations (e.g. in dictator games where the gender composition of the room in which the dictators sit informs the likely gender of the recipient). Or, the other participants can view the participant's decisions so there may be audience or signaling effects (e.g. in Charness and Rustichini (2011) where audience effects in the context of social dilemmas differ by gender).

[7]In Booth and Nolen's (2012) study, adolescent boys and girls are randomly assigned to sit in 4-person groups in a large auditorium and complete five tasks in total, including a maze tournament with their group prior to choosing in a binary-choice lottery task. In our experiment, adult participants are randomly assigned to isolated rooms in groups (3-4 individuals), previous group interactions are nonexistent, and each participant chooses an investment amount in 8 different lotteries.

[8]This also speaks to Manski's (2000) point that peer effects are difficult to identify because they are confounded by information and strategy.

In our experiment, however, no information on others' behavior is transmitted and no social risk was involved in making any decision. The significant effects of the composition of the room on decisions, in our more restrictive setting, suggests the importance of the environment in which individual decisions are made. For example, if a woman makes more risky investments when surrounded by men, the surroundings in which women consider financial or retirement decisions could have an important impact on the ultimate financial health of women and their families. Our results also have organizational implications since they suggest that aggregating individual preferences to predict group behavior would produce different outcomes than those produced by examining group behavior directly. This could be especially important given the context in which decisions are made. The mechanism by which social decisions are reached might be crucial (e.g. secret balloting versus assemblies). Preference reversals are possible, and voting in committees, for instance, might be biased and voters subject to regret.

Finally, our results show that gender differences in behavior are not immutable. Indeed, women might adapt to their environment quite rapidly. This is important because it suggests that a woman's behavior in male-dominated activities might end up being similar to that of a man. Adaptation to the environment, however, might not be costless. While the observed behavior of both men and women might be similar, women might enjoy the task less. This would be consistent with women's preferences having a strong effect on job selection even in the absence of any other observable differences (e.g. Dohmen and Falk 2011; Buser, Neiderle and Oosterbeek, 2014).

The paper is organized as follows. Section 2 describes our experimental design, Section 3 shows results, Section 4 discusses potential explanations for the results, and Section 5 concludes.

2 Experimental Design

Individuals are sent an invitation to participate in an experiment on a particular date and time. The date and time are randomly assigned, and participants cannot choose a different date and time. Participants arrive at the lab and are randomly assigned to one of two isolated rooms with identical setups. The room assignment procedure is transparent to everyone and guarantees that the gender composition of the room in which participants make decisions is random and this is common knowledge. One room is called A and the other B. The letter of the room and a seat number is written on an index card. The index cards for the two rooms are shuffled in front of participants, and each participant chooses a face-down card assigning a room and a seat.

Each room has a table with four laptop computers arranged such that, when seated, each participant's computer screen is not visible to any other participant (see Figure 1 for a picture of the room setup). There are no privacy dividers, and all participants can see everyone else in the room during the entire experiment. The room composition is never explicitly mentioned to the participants, but they can naturally see who else is in the room. Each laptop has a computer mouse to facilitate decision making, and there is a bingo cage with numbered balls on the table. Participants enter the room and sit at the seat number listed on their index card. The seat number also serves as the login number. The instructions for the experiment are on the computer screen, and the participants follow along as an experimenter reads the instructions out loud. Participants are not allowed to communicate with one another at any point during the experiment. A copy of the instructions is in the Appendix. Both experimenters were male and were randomly assigned to rooms as well.

Participants make individual decisions over eight separate lotteries. The lotteries we use are similar to those used by Gneezy and Potters (1997) except that half of the investment decisions include the possibility to lose more than the amount invested. This measure of risk preferences is appealing to use because it is based on a simple, intuitive investment decision, rather than a multiple price list of binary lottery choices.

For each lottery, a participant is asked how many dollars out of \$10 he would like to put in a lottery that pays H with 50% probability and L with 50% probability, where H>\$1>L. The participant can allocate any amount from zero to ten dollars, in one dollar increments, in the lottery. Any dollar not allocated to the lottery pays \$1 with certainty. For the eight lotteries, H can take on one of four values, {\$1.50, \$2.00, \$2.50, \$3.00}, and L can take on one of two values, {\$0, -\$0.50}. The eight lotteries are constructed from all possible combinations of H and L. Three of the lotteries have an expected payoff strictly less than \$1, two have an expected payoff equal to \$1 and three are strictly greater than \$1.

Figure 2 shows a picture of the decision screen for a lottery where H=\$1.50 and L=-\$0.50. The participant enters the amount of money he would like to allocate to the lottery in the box on the left side of the screen. On the right side is a table that lists total earnings for all possible amounts of money put in the lottery, conditional on whether the high payoff, H, or low payoff, L, is randomly chosen. The participant enters the amount to put in the lottery and clicks update. The payoffs for that decision are highlighted in the table. The participant is free to change his decision at any time and can easily move between the eight decisions to make changes. The confirm button for each decision must be clicked before all decisions can be submitted.

It is important to note that payoffs in the experiment depend only on the individual's own decisions and chance. The choices of the other participants in the room have no bearing

whatsoever on an individual's payoffs. Our setup is different from previous studies that have looked at the effect of room composition because in those studies the actions or presence of others had some impact on an individual's payoffs or expectations. For example, in terms of payoffs, a room made up primarily of men might affect decisions, and therefore payoffs, in a public goods game where an individual is making decisions in a randomly-assigned group composed of a portion of the people in the room. Or, in terms of expectations, the gender composition of the room may affect giving decisions in a dictator game, where participants are divided into two rooms with dictators in one and recipients in the other, because the proportion of men and women in the room will give the dictator some expectation of the gender of the recipient in the other room. Our design, by contrast, allows us to measure the effect of the environment (room composition) on decisions without these type of payoff or expectation confounds.

The eight lotteries are presented in a random order for each participant. Because of this, at any given time during the decision making phase of the experiment, the individual participants in the room are making different decisions. This is an important element of the experimental design because it ensures that choices across participants for a particular lottery are uncorrelated. This allows us to further isolate environmental effects from choices.

Decisions are made on the computer. When all eight decisions are submitted by everyone in the room, one decision is randomly chosen to be paid by using the bingo cage. Eight balls, numbered 1 to 8, are placed in the bingo cage and mixed up in front of the participants. One ball is drawn from the cage, with the number on the ball corresponding to the decision number to be paid. Because the eight lotteries over which the participants made decisions are presented in a random order for each participant, paying for a particular decision number meant that each participant is ultimately paid for a different lottery.

Once a decision has been chosen to be paid, two more bingo balls are put in the bingo cage, numbered 9 and 10. The bingo cage is mixed up again, and a ball is chosen to determine the amount paid for the decision chosen. Bingo balls with numbers 1-5 paid one amount and balls numbered 6-10 paid another amount. Finally, whether the amount paid for each set of numbers is the larger or smaller amount ($\$H$ or $\$L$) also differs across participants. This means that a draw of ball number 1, for instance, may pay a low return for one participant but a high return for another. All participants know these procedures ahead of time. Our protocol ensures that participants have little to learn from others decisions, attitudes or reactions. Participants make different decisions over the course of the experiment, and in addition, their payments are not correlated in any way.

Total earnings from the experiment include the payoff from the lottery chosen for payment plus a $6 show-up fee. Participants are paid in cash privately. Because the lotteries include

losses, total earnings from the experiment could be as low as $1. Average earnings were $17.02 (s.d. $7.45), and the experiment lasted 30 minutes in total. There were 140 participants in the experiment across 39 sessions (we refer to an experiment conducted in a room a session). Sessions consisted of 3 or 4 people, depending on the number of participants that showed up.[9] We control for the number of participants in the room in the the data analysis and find no significant effect. Over half of the participants were male (58%), and in terms of race, most self-classified as White (75%) or Asian (19%) with 6% in other classifications. We also control for the racial composition of the room in the data analysis and find no significant effect.

3 Results

There are two main results. First, we confirm that men are more risk taking than women. Second, the gender composition of the room affects the risk taking behavior of women but has no effect on men.[10] In particular, women become more risk taking in the company of men.

Our first result is illustrated in Figure 3. The figure shows the average amount of money invested in the lottery by men and women for each of the eight lotteries. The lotteries are ordered from left to right such that the lotteries are increasing in expected value and variance. The first three lotteries on the left have an expected payoff of less than $1, the middle two have an expected payoff of $1, and the last three lotteries have an expected payoff greater than $1. A risk neutral individual should not invest in the first three lotteries, should be indifferent in investing in the middle two and should invest all his $10 in the last three.

The figure shows that investment in the lottery increases for both men and women as expected payoff goes up. The amount of money invested, however, is always larger for men than women for every lottery, and it is significantly larger in five of the eight lotteries. This result that men are more risk taking than women confirms previous research both generally (Croson and Gneezy, 2009) and specifically in the context of tasks similar to the one used here (Charness and Gneezy, 2012). It also gives us confidence that our data are not anomalous.

[9]Sixteen of the sessions had 3 participants and 23 had 4 participants. The distribution of gender composition of the rooms with 3 participants is: one all female, 8 with one male and two females, 4 with two males and one female, and 3 all male. The distribution of gender composition of the rooms with 4 participants is: one all female, 3 with one male and three females, 7 with two males and two females, 9 with three males and one female, and 3 all male.

[10]Manski (1995) would call this a contextual effect (e.g. the propensity of the individual to behave in some way varies with the distribution of background characteristics of the group). Women are affected by the exogenous variation of the gender composition of the room. Insofar as women have different expectations on how risky choices vary by gender, their choices would be affected by who is in the room.

Our second result is illustrated in Figure 4. The figure shows the average amount invested in the lotteries by men and women as the room composition changes. To account for repeated measures, means and standard errors are calculated using average behavior over the eight lotteries the participants faced. The data are split into five groups: rooms in which there are only women, rooms with only one man, rooms with an equal split of men and women, rooms with only one women and rooms with only men. The amount of money invested in the lottery by men is not significantly different across room compositions. They invest between \$4.50 to \$5.50 no matter who is in the room. Women, on the other hand, increase their investment in the lottery as the number of men in the room increases. In rooms of only women, they invest about \$1.80 in the risky investment, but if they are surrounded by men, they invest about \$4.80. This monotonic increase in risky investments as the number of men in the room increases is significant for women.

This result is confirmed in Tables 1 and 2. In Table 1, for each lottery, we report the z-scores and p-values for a nonparametric trend test (Cuzick, 1985) for trend across ordered groups of the amount invested in the lottery as the proportion of men in room increases.[11] The table shows that, for women, there is a significant increase in amount invested in 7 of the 8 lotteries. By contrast, for men, there is a significant increase in amount invested in only 1 of the 8.[12] This confirms, nonparametrically, that our result in Figure 4 is not only an average effect. Table 2 presents ordered logit regression results of the amount of money invested in the lottery as a function of the gender composition of the room and dummies for each lottery. The regressions are run separately for men and women, and gender composition is specified as the proportion of men in the room other than oneself and ranges from zero to one (e.g. 0, 0.25, 0.33, 0.5, 0.67, 0.75, or 1).[13] All regressions control for the number of participants in the room, either three or four, and because of repeated observations, errors are cluster by participant.

Column 1 in Table 2 shows that, even controlling for lottery type, women put significantly more money in the lottery as the proportion of men in the room increases. As an example, going from a room of all women to one of being the only woman in the room, the odds

[11]Specifically, for each lottery, and separately for men and women, we run a Cuzick (1985) trend test of the amount invested in the lottery on the proportion of men in the room other than oneself.

[12]For women, the test is insignificant for the (2,-0.5) lottery, and for men, the test is significant only for (2.5,0) lottery.

[13]Additional regressions were run where gender composition was specified by dummy variables for whether the participant is the minority sex in the room or the room is composed of all the same sex. The omitted categories are mixed rooms with an equal number of men and women (which only occurs in sessions with 4 participants) and mixed rooms in which the participant is in the majority. All our main results hold in these specifications as well. Because our sessions sometimes had 3 or 4 participants, we present the proportion of men in the room other than oneself in the main results because that specification better accommodates different numbers of participants in the room.

of investing an additional $1 in the lottery is 15 times greater, all else constant.[14] Men, however, do not change the amount placed in the lottery as the gender composition of the room changes (column 2). The gender difference in response to the proportion of men in the room is significant (2.71 for women, -0.60 for men).[15] As a robustness check, since the number of same-sex sessions is small due to random assignment, we drop the all-female or all-male sessions and rerun the specifications in Columns 1 and 2. The main results still hold. Women invest more in the lottery as the proportion of men in the room increases, men do not, and the gender difference in response is significant.[16]

To test for other demographic effects, Columns 3 and 4 include a variable for the proportion of participants in the room other than oneself who are not classified as White and a dummy variable for whether the decision maker is not classified as White. Race has no significant effect on how much money is put in the lottery for either men or women, and the gender composition effect for women is still significant and of the same magnitude. We conclude that the salient room composition effect is gender and do not include race in further specifications.[17]

To look more closely at how investments in the lotteries are changing as room composition changes, we split the lotteries into three groups: lotteries that have an expected payoff of less than $1 (loss lotteries), lotteries with an expected payoff of $1 (equal lotteries) and lotteries with an expected payoff of greater than $1 (gain lotteries). Columns 5 and 6 in Table 2 show the results of the effect of room composition on investments in loss lotteries for men and women. Columns 7 and 8 do so for equal lotteries, and columns 9 and 10 show results for gain lotteries. These results show that, even for these different type of lotteries, women respond significantly to room composition, but men do not.

Next, classifying the lotteries this way, we look at variation in the extremes of investing: not investing at all in the lottery or going all in. Specifically, we examine how the proportion of zero dollar investments men and women make over the loss, equal and gain lotteries changes as room composition changes. We do the same for the proportion of ten dollar

[14]The coefficient associated with the proportion of men in the room is 2.71, the odds conditional on a one unit increase in this variable is $exp(2.71) \sim 15$.

[15]To test the gender difference in response to room composition, we run a pooled regression and include a dummy variable for being male and interact that with all the independent variables for the specification in Column 1. The coefficient on the interaction term on the proportion of males in the room is -3.05 (p-value of 0.001).

[16]Without the all-female sessions, the specification in Column 1 yields a coefficient on the proportion of males in the room of 1.99 (p-value=0.038) for women. Testing the gender difference in response without the all-female sessions yields a coefficient on the interaction term on the proportion of males in the room to be -2.38 (p-value=0.020). Without the all-male sessions, the specification in Column 4 yields a coefficient on the proportion of men in the room of -0.96 (p-value=0.358).

[17]The remaining results in the paper are robust to the inclusion of the race variables.

investments. Table 3 shows ordinary least squares (OLS) regressions for the proportion of zero dollar investments. For loss, equal and gain lotteries, women are significantly less likely to not place any money at all in the lottery as the proportion of men in the room increases. The proportion of times that women do not invest at all in the lottery decreases by 31-61 percentage points depending on the lottery expected payoff as they become surrounded by men. For men, there is no significant effect of room composition.

Table 4 shows the results of going "all-in" the lottery. The OLS regressions are the proportion of investments of the entire endowment (ten dollars) as room composition changes for loss, equal and gain lotteries. The only significant effect is that men are less likely to go all-in for loss lotteries as they are surrounded by men. There are no other significant effects of room composition for men and none at all for women on the all-in investments. Taken together, Tables 3 and 4 suggest that the overall change in behavior of women is solely a result of a decrease in zero-bets as the proportion of men in the room increases.

In sum, our results show that women are affected by who is in their presence when making individual choices over risky investments but men are not. Women become significantly less risk averse as the proportion of men in the room increases.

4 Discussion

In this section, we consider some possible explanations for our main result that women are significantly affected by the gender composition of the room. We discuss status-seeking, feeling "rushed" in making decisions, saliency of gender identity, and conformity. Among these, our main result is most consistent with women being aware of the social context and conforming to the expected behavior of others.

Status Seeking

Participants may perceive the risky decision task as a tournament of who makes the most money in the room, despite the fact that all decisions and payoffs are private. If being the highest earner in a particular group confers status, then we would expect the room composition to matter.[18] The best way to be the highest earner would be to invest more in lotteries with an expected gain and refrain from investing in lotteries with an expected loss. Looking at these type of lotteries, women reduce their average investment in expected loss lotteries in same-sex groups ($1.29) compared to minority groups ($3.30), however they do not invest

[18]Status can be valued as a means to obtain future resources or as an end in itself (Huberman, Loch and Onculer 2004). Participants would alter their choices to be the highest earner in the room depending on who else was there.

more in expected gain lotteries ($2.67 in same-sex groups versus $5.82 in minority groups).[19] The average investment choices of women are not consistent with a desire to be the highest earner among other women or among men.

To look at this another way, we calculate the expected probability a woman would have the largest payoff in a session. We do this by recalculating payoffs 10,000 times for rooms of different gender composition.[20] In rooms in which men are the minority, the probability that a women would have the largest payoffs is 28.2% and for men is 35.9%. This difference is significant (t-test of difference in means p-value = 0.002). In rooms with an equal number of men and women, the probability that a women would have the largest payoffs is significantly lower at 22.3% compared to men at 27.7% (p-value = 0.077). Only in rooms where women are the minority is the probability of having the largest payoff the same for men and women (27.9% for women and 26.8% for men, p-value = 0.627). This suggests that women are not seeking status by changing their lottery investments across room composition to compete for the largest payoff in the room.[21]

Feeling Rushed

Participants in our experiment who make their decisions faster also tend to make riskier choices. The correlation between the total time to complete all eight lottery decisions and the average amount invested in the lottery is -0.1514 (p-value = 0.0742), so those who invest more take less time.[22] If women feel rushed to complete the task in the presence of men,

[19]For men, they do not change their investments in expected gain and loss lotteries in same-sex and minority groups. They invest $6.14 in expected gain lotteries and $3.08 in expected loss lotteries in all-male groups and $7.27 and $3.00 respectively in minority groups.

[20]To calculate these probabilities, we randomize the determination of payoff of each person in a group given their decision, as we do in the experiment, and estimate the probability that each person would obtain the highest payoff in the group. We repeat this process 10,000 times.

[21]The results from the literature on tournament competitions that examine the effect of the gender of the opponent on female competitiveness are mixed. Gneezy, Niederle and Rustichini (2003) find that women perform better in a same-sex tournament than in mixed-sex tournament in which participants solved mazes, although the difference is not significant (two-sided p-value=0.1025). In a running race, girls improve more when competing against boys than girls (Gneezy and Rustichini, 2004). Datta Gupta, Poulsen and Villeval (2013) find that only men are affected by the gender of the opponent, and the results from Cotton, McIntyre and Price (2009) show that gender differences in tournament performance disappear over time.

[22]The total time to finish the task is the time it takes the participant to complete and submit all eight decisions. Because participants could go back and forth between decisions to change them, we only record the time from log in to final submission. The correlation for women is -0.0574 (p-value=0.6658) and for men is -0.1888 (p-value=0.0914)

they may make riskier decisions than in groups of women.[23] This does not seem to be the case.

In Table 5, columns 1 and 2 show OLS regression results of the total time taken to make decisions by men and women on room composition, and Columns 3 and 4 show similar regression results for total number of mouse clicks taken to make all decisions. Neither men nor women are significantly affected by room composition for time to complete decisions or number of mouse clicks. Moreover, there is no evidence that the time others take to make decisions affects investment decisions. Columns 1 and 2 in Table 6 show OLS regression results of investment decisions on the time taken by others to finish the task. Neither men nor women change their investment decisions based on the time taken by others to complete decisions.[24] Our main result is not consistent with women feeling rushed in the presence of men.

Priming of Gender Identity

The composition of the group might prime gender identity. Since gender identity is more likely to be salient when a person is in the minority (McGuire, 1984) and women are generally found to be more risk averse than men (Croson and Gneezy 2009, Eckel and Grossman 2008b), we would expect women to focus more on this aspect of gender identity in groups in which they are in the minority.[25] If risk aversion is seen as an expectation of how women should behave, then this mechanism suggests women would choose most risk aversely in the groups in which they are the minority. As shown in Figure 4, this is not the case in our experiment.

On the other hand, if risk aversion is seen as a negative trait, women may try to disconfirm the stereotype by behaving less risk aversely when in the minority, and our main result is consistent with this alternative. Previous research on stereotype threat, however, shows that performance is harmed when this threat is triggered (see Walton and Cohen, 2003 and Nguyen and Ryan, 2008).[26] In our risky choice task, one way in which performance could be affected is that women feel rushed to make decisions, but we find no evidence for this (see

[23]We note that the correlation between risk and speed in our experiment may simply reflect a correlation between baseline levels rather than the fact that risk taking increases when participants are rushed. Kocher, Pahlke and Trautmann (2013) find that risk aversion over gains is not affected by being rushed while risk aversion over pure losses actually increases.

[24]Similar results hold for the number of clicks taken by others. There is no significant effect on the average risky investment. Coefficients on the average number of clicks by others on average risky investment are -0.00 (p-value=0.973) for women and -0.00 (p-value=0.972) for men.

[25]We note that gender identity might manifest in other behaviors as well. The patterns discussed in this section seems the most reasonable. Also, gender stereotypes of risk attitudes have been found to be persistent (see Grossman 2013 and Grossman and Lugovskyy 2011 for recent work).

[26]It is difficult to assess stereotype threat without clear predictions on what expectations would be. Any data could be rationalized if expectations are undefined. For this reason, we examine performance and risky choice.

Table 5).[27] We conclude that the evidence for stereotype threat as an explanation is mixed.

Conformity

Finally, participants might seek to either conform to or imitate the behavior of others in the group. Our experimental data is consistent with the joint hypothesis that women are aware of the social context, attempt to mimic the behavior of others in the room and men are expected to be more risk taking than women.[28] Table 6, columns 3-6, show that both men's and women's time to complete the task and number of mouse clicks made are positively correlated with the time to finish the experiment and the number of mouse clicks made by others in the room. This is consistent with both men and women paying attention to the observable actions of others, however, only women are affected by the composition of the room and invest more in the risky asset as the number of men in the room increases. Women seem to internalize the social context and mimic what others around them are likely deciding to do based on their gender. In this way, our results are consistent with the tendency of women to conform more than men as shown in the Asch (1951) line of conformity studies (Cooper 1979, Eagly and Carli 1981, Bond and Smith 1996) and social comparison theory (Levinger and Schneider, 1969).

In sum, our main finding that women become less risk averse as the proportion of men in the room increases is most consistent with women taking into account the social context and conforming to the behavior of others. The channel of stereotype threat as an explanation has mixed support. In addition, we find no evidence that women are competing to make the highest payoff or feeling rushed.

5 Conclusion

We examine the influence of social context on individual decision making in the absence of behavioral information feedback, strategic interaction or payoff relevant information. To do this we randomly assigned experimental participants to sessions and within sessions to different rooms and asked them to privately make a series of lottery decisions involving gains and losses. Participants faced menus that were personalized in terms of the order in which the lotteries were presented, the lottery selected to determine payoffs and the randomizing device used with each individual. That is, experimental participants faced completely individualized decisions with no meaningful way to link their decisions, payoffs and actions to the decisions,

[27] In our experimental task, women may be attempting to avoid stereotypes but the lottery task is not complex enough for completion time to be significantly affected.

[28] Eckel and Grossman (2008b) find that female participants are more risk averse than men, and that this is correctly predicted by others.

payoffs and actions of other participants in the room. We find that, even under these strict conditions, individual decisions are strongly influenced by the gender composition of the room: women become less risk averse as the proportion of men in the room increases, to the point where women's choices, when surrounded only by men, are indistinguishable from those of men. The effect is large. For a risky asset, a woman surrounded by women invests less than half of the amount than when she is the sole woman in the room surrounded by men.

This change in behavior is not consistent with women trying to compete for the largest payoff in the room and implies that theories based on status seeking cannot explain our data. Nor is the result due to women feeling rushed and therefore making riskier decisions. There is no significant relationship between time to make decisions and the composition of the room nor is the time others take to make decisions at all related to the amount invested in risky investments. Finally, we find no support for gender identity priming and mixed support for stereotype threat as explanations.

Rather, our result that women are more risk taking in the presence of men is most consistent with research showing women are more likely to conform than men (Bond and Smith, 1996). Women seem to be paying attention to their surroundings and then incorporating the social context into their decisions by matching their choices to a common expectation of how men and women decide when making risky investments.

Our experiment shows that the characteristics of those around us have an effect on decisions independent of feedback or payoff-relevant information. Decisions over risky alternatives made while surrounded by others are affected by the gender mix in the room even when decisions are individual and uninformative to the decisions of others. The effect is manifested in the decisions of women, not men, and seems to be due to the activation of homegrown expectations and imitation.

The findings depart from previous literature that has found women more risk taking and competitive in same-sex groups and suggest that once other interacting factors have been removed preferences are expressed differently. The results also have implications for the measurement of individual preferences and their aggregation. Depending on the environment in which individual decisions are made, individual and aggregate preferences could differ significantly, even when decisions are private. It also shows that women might adapt more to their environment than men independent of their underlying preferences. The composition of one's peers, co-workers or friends could have a fundamental effect on preferences, apart from payoff-relevant information.

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7 Figures and Tables

Figure 1: Room Setup for Experiment

Figure 2: Example Decision Screen for payoffs of $1.50 or -$0.50

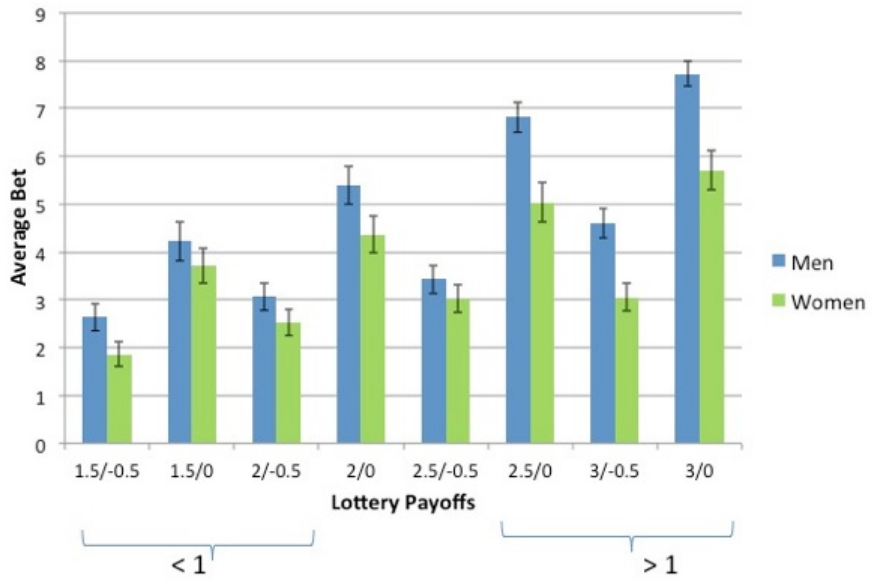


Figure 3: Average Investment by Lottery and Gender (Error bars are standard errors of the mean)

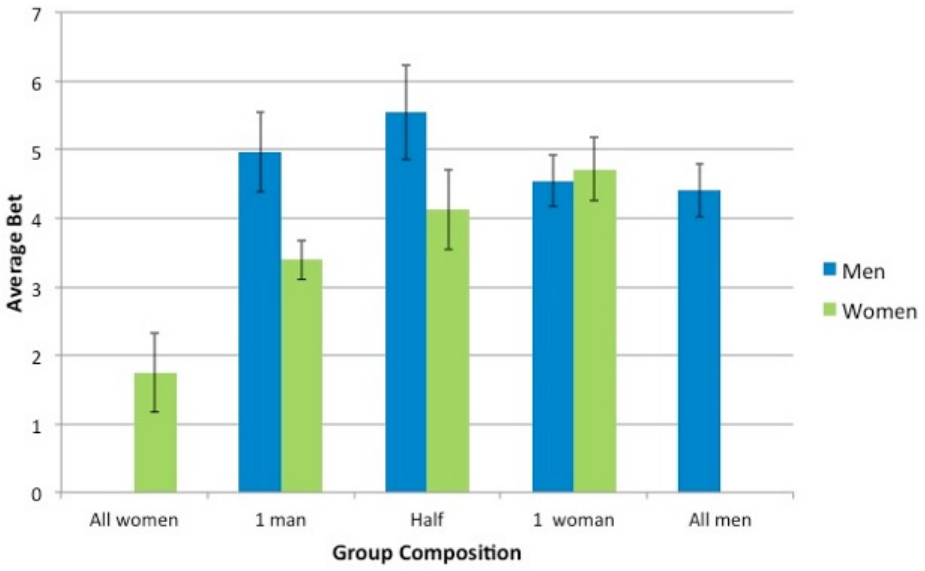


Figure 4: Average Investment by Room Composition and Sex (Error bars are standard errors of the mean)

Table 1: Nonparametric Trend Test (Cuzick, 1985) for Amount Invested in Lottery as Proportion of Men in Room Increases by Individual Lottery and by Gender

	Women		Men	
LOTTERY	z-score	p-value	zscore	p-value
(1.5, 0)	2.48	0.013	-0.88	0.378
(1.5, -0.5)	1.91	0.056	-0.01	0.994
(2, 0)	3.96	0.000	-0.43	0.670
(2, -0.5)	1.39	0.166	-0.22	0.823
(2.5, 0)	2.14	0.032	-2.21	0.027
(2.5, -0.5)	2.87	0.004	-1.43	0.153
(3, 0)	1.99	0.047	0.72	0.472
(3, -0.5)	2.10	0.036	-0.78	0.434
Observations	59		81	

Table 2: Ordered Logit of Lottery Investment by Room Composition, Gender and Lottery

VARIABLES	(1) All Women	(2) All Men	(3) All Women	(4) All Men	(5) Loss Women	(6) Loss Men	(7) Equal Women	(8) Equal Men	(9) Gain Women	(10) Gain Men
Proportion of males	2.71***	-0.60	2.51***	-0.53	2.36**	-0.42	4.26***	-0.75	2.15**	-0.70
	(0.813)	(0.571)	(0.845)	(0.552)	(1.026)	(0.859)	(1.055)	(0.750)	(0.884)	(0.673)
Proportion of non-whites			-0.42	0.53						
			(0.773)	(0.863)						
Non-white			-0.25	-0.11						
			(0.340)	(0.335)						
Group size 3	0.17	0.06	0.14	0.06	0.23	-0.25	0.29	0.07	0.09	0.39
	(0.332)	(0.286)	(0.334)	(0.284)	(0.433)	(0.390)	(0.422)	(0.393)	(0.395)	(0.343)
(1.5,0) lottery	0.43	-0.19	0.44	-0.19	0.82***	0.61***				
	(0.271)	(0.295)	(0.274)	(0.297)	(0.268)	(0.214)				
(1.5,-0.5) lottery	-0.97***	-1.12***	-0.97***	-1.12***	-0.61***	-0.28**				
	(0.247)	(0.210)	(0.249)	(0.209)	(0.224)	(0.117)				
(2,0) lottery	0.86***	0.56**	0.87***	0.56**			0.98***	1.10***		
	(0.267)	(0.262)	(0.269)	(0.261)			(0.280)	(0.219)		
(2,-0.5) lottery	-0.35	-0.83***	-0.36	-0.83***						
	(0.221)	(0.178)	(0.223)	(0.177)						
(2.5,0) lottery	1.29***	1.33***	1.31***	1.33***					1.20***	1.51***
	(0.261)	(0.189)	(0.265)	(0.189)					(0.249)	(0.213)
(2.5,-0.5) lottery	-0.01	-0.63***	-0.00	-0.64***						
	(0.204)	(0.149)	(0.203)	(0.149)						
(3,0) lottery	1.77***	1.86***	1.77***	1.86***					1.62***	2.06***
	(0.265)	(0.224)	(0.270)	(0.223)					(0.257)	(0.240)
Observations	472	648	472	648	177	243	118	162	177	243
Log likelihood	-990.27	-1330.07	-988.59	-1328.78	-343.25	-490.22	-243.51	-348.76	-390.36	-474.42

Standard errors clustered by participant. *** p<0.01, ** p<0.05, * p<0.10

Table 3: Ordinary Least Squares Regressions of Proportion of Investments of Zero Dollars by Lottery Type, Room Composition and Sex

	(1)	(2)	(3)	(4)	(5)	(6)
	Loss	Loss	Equal	Equal	Gain	Gain
VARIABLES	Women	Men	Women	Men	Women	Men
Proportion of males	-0.47**	-0.06	-0.61***	0.11	-0.31**	0.04
	(0.200)	(0.209)	(0.180)	(0.177)	(0.141)	(0.063)
Group size 3	-0.00	0.04	-0.02	0.02	-0.03	-0.03
	(0.092)	(0.103)	(0.082)	(0.087)	(0.065)	(0.031)
Constant	0.47***	0.36**	0.41***	0.11	0.24***	0.02
	(0.105)	(0.160)	(0.094)	(0.135)	(0.074)	(0.048)
Observations	59	81	59	81	59	81
R-squared	0.09	0.00	0.17	0.01	0.08	0.02

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10

Table 4: Ordinary Least Squares Regressions of Proportion of Investments of Ten Dollars by Lottery Type, Room Composition and Gender

	(1)	(2)	(3)	(4)	(5)	(6)
	Loss	Loss	Equal	Equal	Gain	Gain
VARIABLES	Women	Men	Women	Men	Women	Men
Proportion of males	0.01	-0.17*	0.10	-0.21	0.23	-0.19
	(0.037)	(0.087)	(0.102)	(0.132)	(0.142)	(0.171)
Group size 3	-0.02	-0.01	0.01	0.06	-0.01	0.10
	(0.017)	(0.043)	(0.046)	(0.065)	(0.065)	(0.084)
Constant	0.01	0.18***	-0.00	0.26**	0.04	0.41***
	(0.019)	(0.067)	(0.053)	(0.101)	(0.074)	(0.131)
Observations	59	81	59	81	59	81
R-squared	0.02	0.05	0.02	0.04	0.05	0.04

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10

Table 5: Ordinary Least Squares Regressions of Time Taken to Submit Decisions and Number of Clicks Made by Room Composition and Gender

VARIABLES	(1) Time to Submit Women	(2) Time to Submit Men	(3) Num of Clicks Women	(4) Num of Clicks Men
Proportion of males	-59.42	-54.03	31.86	19.74
	(106.62)	(59.44)	(64.98)	(31.30)
Group size 3	77.52	13.75	44.68	-3.33
	(48.74)	(29.39)	(29.71)	(15.48)
Constant	351.82***	349.27***	113.42***	132.99***
	(55.94)	(45.48)	(34.09)	(23.94)
Observations	59	81	59	81
R-squared	0.06	0.01	0.04	0.01

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10

Table 6: Ordinary Least Squares Regressions of Average Investment, Time Taken to Submit Decisions and Number of Clicks Made by Behavior of Others in Room and Gender

VARIABLES	(1) Avg Investment Women	(2) Avg Investment Men	(3) Time to Submit Women	(4) Time to Submit Men	(5) Num of Clicks Women	(6) Num of Clicks Men
Avg time taken	-0.00	0.00	0.59***	0.54***		
by others	(0.002)	(0.002)	(0.156)	(0.121)		
Avg number of clicks					0.92***	0.26**
by others					(0.167)	(0.104)
Group size 3	-0.07	0.04	46.02	-3.53	20.09	-6.94
	(0.518)	(0.524)	(43.775)	(26.620)	(23.738)	(14.945)
Constant	4.18***	4.15***	137.26**	139.70***	6.04	109.89***
	(0.669)	(0.803)	(56.610)	(40.781)	(26.477)	(17.101)
Observations	59	81	59	81	59	81
R-squared	0.01	0.01	0.24	0.21	0.37	0.07

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10

8 Appendix

Instructions

Welcome

Welcome to the experiment. This session will last about an hour.

For being willing to participate, you will automatically earn $6. At all times please keep the ID number that you were given at the beginning of the session in a secure place. You will be required to turn this in at the end of the experiment in exchange for your payment.

Anonymity

Your name **will not be revealed** to the supervisor or any other person. At no time, either during or after the experiment, will your name be matched to your decisions or your payment.

This Experiment

In this experiment, you will be deciding how much money you would like to bet on a series of eight lotteries. During the experiment, these lotteries will be displayed on your computer screen in a random order. **For each lottery, you will have $10 to bet.** Of this $10, you must decide how much you would like to wager in the lottery. Once you have finished betting on the lotteries, a lottery will be randomly chosen from the series. This lottery will be the *paying lottery*. Your final winnings will be determined by combining your show up fee of $6 with any winnings or losses from the *paying lottery*.

Lotteries

Each lottery has two possible outcomes: one is a winning outcome and one is a losing outcome. For each lottery, you have a 50% chance of ending up in a winning outcome and a 50% chance of ending up in a losing outcome. To determine whether you win or lose the *paying lottery*, one lottery ball will be randomly drawn out of 10 from the lottery cage. For some lotteries, balls 1-5 represent the "Winning" balls and for some, balls 6-10 represent the "Winning" balls. After you place your bet, the computer will show you how much you stand to win or lose for each of the possible selected numbers.

Each lottery differs in how much you stand to win in the winning outcome and how much you stand to lose in the losing outcome. In the winning outcome of all the lotteries, you will get back at least two times your bet. In the losing outcome of the lotteries, you will either lose just what you bet or you will lose what you bet plus an additional 50% of your bet which will be subtracted from your remaining money (including, possibly, your

show-up fee). Any money you do not bet in a lottery will automatically be added to your winnings. Keep in mind, you will not know which of the lotteries is the *paying lottery* until after you have placed all your bets, so it is wise to pay careful attention to each one. Below are some examples to get you comfortable with the betting process.

Examples

Example 1:

For Each Dollar Bet:

With Probability 1/2 You Win $2

With Probability 1/2 You Lose $0 in Addition to the Money You Bet

If you were to bet $5 on this lottery:

Winning Outcome: $15.00

Losing Outcome: $5.00

If you were to bet $0 on this lottery:

Winning Outcome: $10.00

Losing Outcome: $10.00

If you were to bet $10 on this lottery:

Winning Outcome: $20.00

Losing Outcome: $0.00

Example 2:

For Each Dollar Bet:

With Probability 1/2 You Win $3

With Probability 1/2 You Lose $0.50 in Addition to the Money You Bet

If you were to bet $5 on this lottery:

Winning Outcome: $20.00

Losing Outcome: $2.50

If you were to bet $0 on this lottery:

Winning Outcome: $10.00

Losing Outcome: $10.00

If you were to bet $10 on this lottery:

Winning Outcome: $30.00

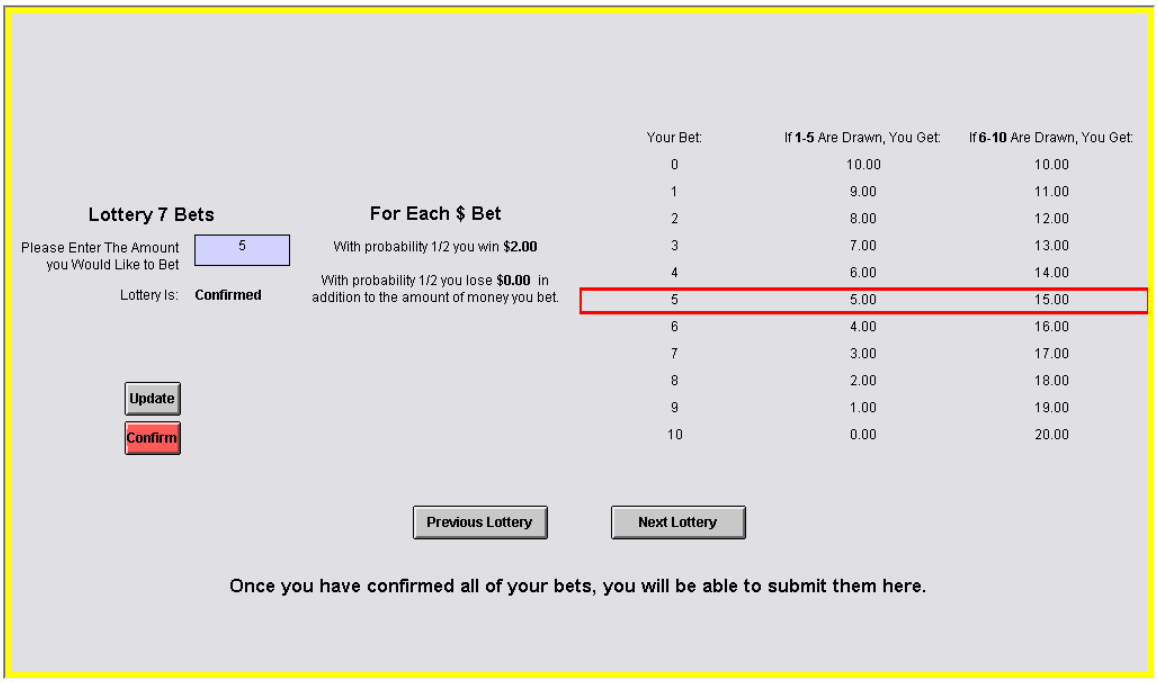
Losing Outcome: -$5.00

Choices and Payoffs

Once the experiment starts, you will see your first lottery on the screen. On the left side of the screen you will be able to enter and confirm your bets. To the right of that, you will see the details of the lottery you are currently betting on. Here, you will see what the lottery pays, per dollar, if you win and how much you will lose, per dollar, if you do not win. On the far right of the screen, your total earnings from each bet are displayed in a grid showing what you will win or lose for each possible ball drawn in the lottery if that lottery is chosen as the *paying lottery*.

Look at the example screen below. In this example, you would be paid $2.00 for each dollar bet in the winning state, and in the losing state, you only lose the amount of money bet. For example, if you bet all $10 in the lottery and if this lottery were to be chosen as the *paying lottery*, you would earn $20 if any ball between 1 and 5 is drawn from the bingo age and $0 if any ball between 6 and 10 is drawn. If you bet $5 in the lottery, you would earn $15 if any ball between 1 and 5 is drawn and $5 if any ball between 6 and 10 is drawn. If you bet no money, any ball drawn between 1 and 10 pays you $10.

Look at the screen below. When you enter your bet and click the "Update" button, a box will appear around your chosen bet. You are free to change your bet at any time. You can confirm your bet by clicking the "Confirm" button. When you do so, the box around your confirmed bet will change to red and the lottery will now be confirmed.



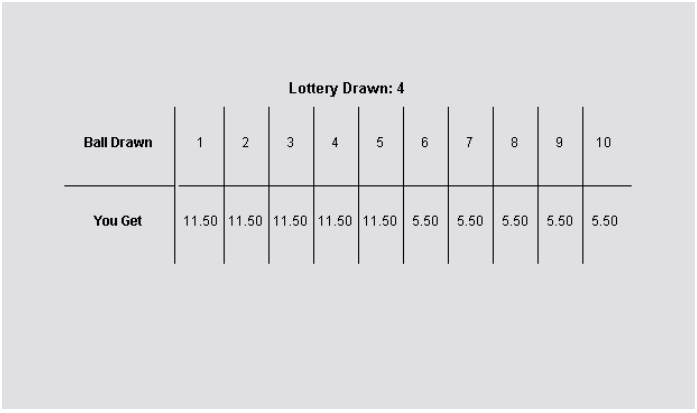
Look at the screen below. In this screen, below the lottery, you can see a button: "Next Lottery". There is also another button, "Previous Lottery" that will appear in all lotteries past the first. These buttons can be used to flip through the lotteries. Feel free to go back

and forth between lotteries as much as you like. You can change your bet on any lottery at any time by entering a new number and clicking update.

Once you have confirmed all of the lotteries, a new button will appear at the bottom allowing you to submit your bets. When you are happy with all of your bets, click this button to lock in your decisions. No changes after this point are possible, so please make sure you are happy with your bets before submitting.

Lottery Selection and Payment

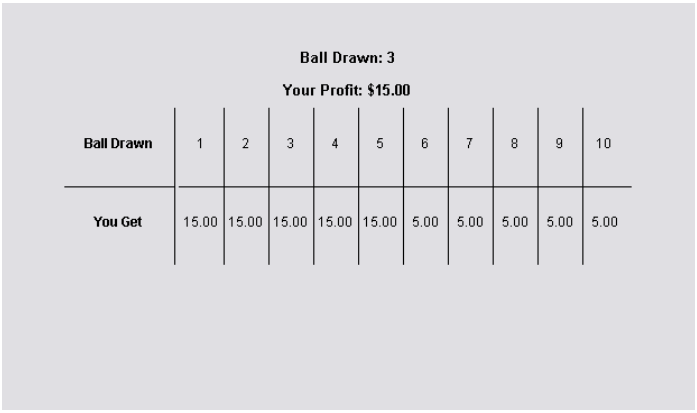
After everyone in the room has submitted their decisions, we will randomly draw a number between 1 and 8 from the bingo cage. The lottery in your series matching the drawn number will become your *paying lottery* and the lottery payment grid for that lottery will appear on your screen as shown below.



Lottery Drawn: 4

Ball Drawn	1	2	3	4	5	6	7	8	9	10
You Get	11.50	11.50	11.50	11.50	11.50	5.50	5.50	5.50	5.50	5.50

After this, ten balls will be placed in the lottery cage. From these, one will be randomly drawn and this will become the winning lottery number. A new screen will appear confirming the winning number and the amount of money you have earned. An example of this screen is shown below.



Ball Drawn: 3

Your Profit: $15.00

Ball Drawn	1	2	3	4	5	6	7	8	9	10
You Get	15.00	15.00	15.00	15.00	15.00	5.00	5.00	5.00	5.00	5.00

Please note that the amount of money shown on this screen is in addition to the $6 show-up fee you earned just for coming to the experiment. There is a possibility of ending up with a negative amount of money from the lottery, in this case, that amount of money will be subtracted from your show-up fee.

Once the lottery is done, another supervisor, outside of the room, will prepare your payment envelope. The envelopes will be labeled with your id number only, so please

make sure you have your id number available. Preparing your payments will take about 10 minutes. Once all of the envelopes have been prepared, you can collect your earnings.

Summary

Step 1: You will be shown a series of eight lotteries.

Step 2: You will enter the amount you want to wager in each lottery (Up to $10 for each).

Step 3: You can easily go back and forth between the lotteries and change your bets until you are happy with your bet in each lottery.

Step 4: Once you are happy with all of your bets, you will submit your decisions.

Step 5: One number from 1 to 8 will be randomly drawn from the bingo cage. The number chosen will be the *paying lottery*.

Step 6: One number from 1 to 10 will be randomly drawn from the bingo cage as the winning number and you will be paid the amount that corresponds to that number in your *paying lottery.*

Step 7: Everyone will receive cash payments in private envelopes at the end of the experiment.