

# 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.

JEL codes: C91, D81, J16

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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. Businesses invest heavily in the design of the workplace and placement of workers to increase productivity. Individuals may be more well mannered with a priest or a police 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. Understanding whether such effects exist is important because they imply that the mere presence of certain others can affect the choices of individuals. The existence of these effects means 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. The results are striking. We find that the gender composition of the room alters individual behavior. Women are more risk taking as the proportion of men in the room increases, whereas men are unaffected. This change in behavior seems to be mainly driven by awareness of social context and conformity.

In our research design, individuals are invited to participate in a laboratory experiment on decision making and randomly assigned to a particular date and time. After all participants arrive, they are randomly assigned to one of two rooms and a seat within the room. Each room is identical with four computers arranged around a table in a way that guarantees privacy of decisions but allows participants to naturally observe the gender composition of the room. At no point is the composition of the room, or gender, explicitly mentioned.

Participants are asked to make a series of eight decisions which consist of dividing \$10 between a certain option that pays \$1 per dollar invested and an investment that pays 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.<sup>1</sup> In three of the decisions, the investment has an expected return below one dollar per dollar invested, in three of the decisions, the investment has an expected return above one, and in two of the decisions the investment has an expected return of exactly one.

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<sup>1</sup>The design is based on Gneezy and Potters (1997). It is a simple design that requires participants to make a choice between how much to invest in a risky and safe lottery (Charness Gneezy, & Imas, 2013).

While all the participants in a room face the same set of decisions, they face them in different random orders.

Individual payoffs are based on one of the eight decisions and chance. Importantly, in no way are individual payments affected by the decisions or actions of the other people in the room. In addition, the decision selected for payoff is 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 are private, so no participant know what another decided or earned.

By random assignment to the date and time of an experimental session, we minimize selection on unobservables into particular sessions and the chance that participants know one another in the session or would interact with each other afterwards. 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.

Consistent with previous research (Croson & Gneezy 2009; Eckel & Grossman 2008b), we confirm that women are more risk averse than men. This gives us confidence that our data are not atypical. Room composition has a significant effect on behavior, but it is one-sided. Women become less risk averse in the company of men, but men are unaffected by who is in the room. The effect for women is large – a woman is 3.5 times more likely to invest a dollar in a risky lottery when surrounded by men compared to when she is surrounded by women.

The results from our environment are most consistent with women being more aware of the social context and adjusting their decisions 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.<sup>2</sup> This is consistent with psychology studies which find that women are more likely to conform than men (Bond & Smith, 1996), evidence that individuals guess correctly that women’s behavior is more risk averse than men’s (Eckel & Grossman 2008a) and social comparison theory (Levinger & Schneider, 1969).

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<sup>2</sup>Gender differences in development and behavior appear early in life (McClure, 2000; Zahn-Waxler, Shirlcliff, & Marceau, 2008; Baron-Cohen, Knickmeyer, & Belmonte, 2005). One of these differences is that girls are better at reading the social environment than boys.

Our paper is not the first to experimentally investigate the role of audience or room composition on individual behavior. However, in these studies, the actions of participants are linked through behavioral information or payoffs channels. For example, the choices of the other participants may directly affect the participant’s payoffs or the participant’s choices may affect the other participants’ payoffs (e.g. in bargaining, social dilemma or tournament experiments). The gender composition of the room may affect expectations (e.g. in dictator experiments where the room composition in which the dictators sit informs the likely gender of the recipient).<sup>3</sup>

Some studies have specifically examined the gender composition of groups and risk attitudes. Adolescent girls are found to be more risk taking when in same-sex groups (Booth & Nolen, 2012), and women become less risk averse over time in a same-sex class (Booth, Cardona-Sosa, & Nolen 2014).<sup>4</sup> The results of these studies are consistent with research on gender differences in competitive attitudes (Gneezy, et al., 2003; Niederle & Vesterlund, 2007), where women are more likely to compete in same-sex groups, and suggest the importance of audience effects and signaling (Bohnet & Frey, 1999; Charness, et al., 2007; Andreoni & Bernheim, 2009). By contrast, 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.

There are several implications of our results. Peer effects (Bertrand, Luttmer, & Mullainathan, 2000; Duflo & Saez, 2003; Conley & Udry, 2010) might be more basic and influential apart from providing information relevant for economic decisions that is transmitted between group members.<sup>5</sup> Individuals might be affected by how they expect others to behave even if it is not payoff relevant. Our results lend support for the idea that some choices may be a reflective reaction to who is in the room.

In our experiment, 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, suggest the importance of the environment in which individual decisions are made. For example, if a woman makes more risky investments

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<sup>3</sup>See Eckel and Grossman (2001) for gender composition in ultimatum games, Gneezy, Niederle, and Rustichini (2003) for tournaments, Bogan, Just, and Dev (2013) for risk decisions of groups, Charness, Rigotti, and Rustichini (2007) for public and private decisions, Lindquist and Soderbergh (2011) for decisions in Jeopardy’s daily double, Cooper and Rege (2011) and Rohde and Rohde (2011) for peer effects in risky decisions, and Ambrus, Greiner, and Pathak (2015) for aggregation of individual risk preferences.

<sup>4</sup>In Booth and Nolen (2012), 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.

<sup>5</sup>This also speaks to Manski’s (2000) point that peer effects are difficult to identify because they are confounded by information and strategy.

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).

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

The experiment is designed to identify the effect of different gender compositions of rooms on individual decisions over risky investments. The decisions that participants make are uncorrelated and independent to decisions made by others in the room, and this allows us to isolate the effect of room composition on decision-making.

We collect data from three different sites. At the first two sites (Georgia State University and Georgia Institute of Technology), an equal number of men and women (between 8-10 in total) are invited to participate in a randomly-assigned experimental session on a particular date and time. Participants cannot choose a different date or time. Upon arrival at the lab, participants are randomly assigned to one of two isolated rooms with identical setups. 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. This procedure produces randomly-determined room compositions and more rooms of mixed gender than rooms with

only one gender. Most sessions had two 4-person rooms, and because of no-shows, some had one or two of the rooms with 3 participants.<sup>6</sup>

At the third site (Vanderbilt University), the room assignment procedure differed slightly. We invited an equal number of men and women (10 in total) to assure 8-person sessions and focused data collection on same-sex and unequal mixed-sex rooms. In any session, the two room compositions are either same sex, (4w, 0m) and (0w, 4m), or mixed sex, (3w, 1m) and (1w, 3m). These room compositions are randomly assigned to days and times, and participants are invited to a randomly-assigned session date and time. Again, participants cannot choose another date and time. Upon arrival, participants are randomly assigned to the room compositions for that session.<sup>7</sup>

Apart from these differences in room assignment procedures, the experimental sessions proceeded identically across the three sites. We find no evidence that room composition is correlated with time of day. For our main results, we control for session fixed effects to account for differences in procedures and selection. Our main results hold if we restrict the sample to only 8-person sessions and if we also include 6- and 7-person sessions as well. Both sets of results are presented in Table 1.

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.<sup>8</sup>

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

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<sup>6</sup>At the first two sites, there are 21 8-person sessions and 14 6- and 7-person sessions. From the 8-person sessions, 6 of the 42 rooms are single-sex.

<sup>7</sup>At the third site, there are 12 8-person sessions, with 6 rooms each of (4w, 0m), (3w, 1m), (1w, 3m) and (0w, 4m).

<sup>8</sup>We find no evidence that room composition is correlated with either experimenter.

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. 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. In the 8-person sessions, across the three sites, there were 264 participants, 33 sessions and 66 rooms (each room had 4 people). The distribution of gender composition of the rooms is: 7 all-women rooms, 13 rooms with one man, 15 of equal number of men and women, 20 rooms with one woman and 11 all-men rooms.<sup>9</sup> Our main results include 8-person sessions and control for session fixed effects. We also present the results when 6-, 7- and 8-person sessions are pooled.

Over half of the participants were male (55.7%). The most common self-classifications for race are White (50.4%), Black (20.4%) and Asian (16.3%) with 12.9% in other classifications.<sup>10</sup> We 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

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<sup>9</sup>When we combine 6-, 7- and 8-person sessions, there are 356 participants, 47 sessions and 94 rooms (74 4-person rooms and 20 3-person rooms). In these pooled data, the distribution of gender composition of the rooms is: 9 all-women rooms, 24 rooms with one man, 18 of equal number of men and women, 27 rooms with one woman and 16 all-men rooms.

<sup>10</sup>In the pooled 6-, 7- and 8-person sessions, 55.3% are male, 53.1% are White, 18.3% are Black, and 16.6% are Asian.



has no effect on men.<sup>11</sup> 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 four of the eight lotteries. This result confirms previous research both generally (Croson & Gneezy, 2009) and specifically in tasks similar to the one used here (Charness & Gneezy, 2012). It also gives us confidence that our data are not anomalous.

Our second result is illustrated in Table 1. The table presents regression results of the amount of money invested in the lottery as a function of the gender composition of the room, dummies for each lottery and session-level fixed effects. Panel A presents the results for 8-person sessions only, and Panel B presents the results for the pooled data of 6-, 7- and 8-person sessions. The regressions are run separately for men and women, and gender composition is specified as the proportion of men in the room and ranges from zero to one (e.g. 0, 0.25, 0.33, 0.5, 0.67, 0.75, or 1).<sup>12</sup> Because of repeated observations over the eight lotteries, errors are clustered by participant.

Column 1 in Table 1 reports an ordered logit regression of the lottery bet on the gender composition of the room. The results show that women put significantly more money in the lottery as the proportion of men in the room increases. As an example, looking at the results from the 8-person sessions (Panel A), going from a room of all women to one of being the only woman in the room, the odds of investing an additional \$1 in the lottery increases by 3.5, all else constant.<sup>13</sup> Men, however, do not change the amount placed in

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<sup>11</sup>Manski (1999) 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).

<sup>12</sup>All results hold if we instead specify gender composition with dummy variables for whether the participant is the minority sex in the room or the room is composed of all the same sex.

<sup>13</sup>An ordered logit is preferred in this setting because the investment decision may be nonlinear. The return of a dollar invested in the lottery is different across lotteries and the marginal utility of a dollar gained could be decreasing as gains increase (in the case of a risk averse individual). The coefficient associated with the proportion of men in the room is 1.68, the odds conditional on a 0.75 unit increase in this variable is  $\exp(1.68 * 0.75) \sim 3.5$ .

the lottery as the gender composition of the room changes (column 2). This gender gap in response to the proportion of men in the room is significant.<sup>14</sup> As a robustness check, if we drop the all-female or all-male sessions and rerun the specifications in Columns 1 and 2, the main result still holds. 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.<sup>15</sup> The results for the pooled 6-, 7- and 8-person sessions (Panel B) are larger in magnitude and more statistically significant.

The remaining columns in Table 1 illustrate the effects of room composition on alternative measures of the lottery investment. Columns 3 and 4 report a median regression of the amount invested in the lottery. The results confirm that women invest more in the lottery as the proportion of men in the room increase and men are unaffected. In 8-person sessions, the median investment by women significantly increases by \$3. Columns 5 and 6 report the results of a linear probability regression of a dummy variable that equals one if the participant invested zero dollars in the lottery. Women are significantly less likely to invest nothing in the lottery as the number of men in the room increases, and for men, there is no effect. The final two columns (Columns 7 and 8) report the effects of room composition on going “all in” the lottery (investing all \$10). Room composition has no effect for women or men. Taken together, the results from Columns 5-8 suggest that the overall change in behavior of women is primarily due to a decrease in zero-bets as the proportion of men in the room increases. The results for the pooled sessions (Panel B) show similar effects.

To test the robustness and power of our results, we conducted a randomization test for each of the models presented Table 1. The test randomly re-assigns the room composition to each participant but maintains the structure of the data-generating process by assuring that each participant in a given room has the same randomly re-assigned treatment and rooms of 3- and 4-people are assigned a treatment consistent with the number of people. This procedure is consistent with Young’s (2017) approach to test the significance of experimental results. All our main results hold, and the p-values associated with this test are similar to or stronger than those reported in Table 1.<sup>16</sup>

<sup>14</sup>In a pooled regression with a dummy variable for being male and interaction terms 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 -2.34 (p-value of 0.088).

<sup>15</sup>Without the all-female sessions, the coefficient on the proportion of males in the room of 1.65 (p-value=0.071) for women and -0.77 (p-value=0.444) for men. Without the all-male sessions, these are 1.68 (p-value=0.074) and -1.16 (p-value=0.284) respectively. Testing the gender difference in response yields a p-value of 0.087 without the all-female sessions and 0.053 without the all-male sessions.

<sup>16</sup>The number of permutations is 1,000. For Panel A, p-values associated with the “proportion of males” for each column are (1) 0.0320, (2) 0.3130, (3) 0.0440, (4) 0.3180, (5) 0.0030, (6) 0.1270, (7) 0.6230, (8) 0.4570. For Panel B, p-values for each column are (1) 0.0000, (2) 0.7660, (3) 0.0000 (4) 1.0000, (5) 0.0000, (6) 0.9810, (7) 0.4220, (8) 0.5290.

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. Our supporting evidence is based on 8-person sessions, but similar results hold for pooled sessions.

Room composition 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 & Gneezy 2009, Eckel & Grossman 2008b), we would expect women to focus more on this aspect of gender identity in groups in which they are in the minority.<sup>17</sup> If risk aversion is seen as an expectation of how women should behave, then this mechanism suggests women’s behavior would be most risk averse in groups where they are in the minority. As shown in Table 1, this is not the case and thus does not appear to be a plausible explanation.

In general, participants might feel rushed when making decisions because of the observable behavior of others in the room (e.g. time taken to finish the task, number of mouse clicks). We find that those 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 -0.288 (p-value = 0.000).<sup>18</sup> If women feel rushed to complete the task in the presence of men, they may make riskier decisions than in groups of women.<sup>19</sup> There is some evidence for this.

In Table 2, 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, but women have a higher number of mouse clicks as the proportion of men in the room increases. Table 3 (columns 1 and 2) shows that women invest more in rooms where others are making

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<sup>17</sup>Gender stereotypes of risk attitudes have been found to be persistent (see Grossman, 2013; Grossman & Lugovskyy, 2011).

<sup>18</sup>The total time to finish the task is the time it takes the participant to complete and submit all eight decisions. The correlation for women is -0.333 (p-value=0.000) and for men is -0.226 (p-value=0.006)

<sup>19</sup>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.

their decisions faster, whereas men are unaffected.<sup>20</sup> This suggests that women are paying attention to the time taken by others, may feel rushed and then make riskier decisions.

Participants might seek to either conform to or imitate the behavior of others in the group. Our findings are 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.<sup>21</sup> Table 3, 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 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. Women may internalize the social context and mimic what others around them are likely deciding to do based on their gender.<sup>22</sup> 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 & Carli, 1981, Bond & Smith, 1996) and social comparison theory (Levinger & Schneider, 1969).

In sum, our main finding that women become less risk averse as the proportion of men in the room increases is consistent with women taking into account the social context, feeling rushed and conforming to the expected behavior of others.

## 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 two different rooms and asked them to make a series of private 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

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<sup>20</sup>There is no significant effect of the number of mouse clicks on the average risky investment. Coefficients on the average number of clicks by others on average risky investment are -0.005 (p-value=0.209) for women and 0.004 (p-value=0.378) for men.

<sup>21</sup>Eckel and Grossman (2008b) find that female participants are more risk averse than men, and that this is correctly predicted by others.

<sup>22</sup>We collected incentivized data on beliefs at our third site (Vanderbilt). Participants were asked their beliefs of the average investment of the others in the room in three of the eight lotteries. They were paid \$1 for one randomly chosen belief question if their answer was within \$1 of the true average of the investments of others in the room. Both men and women expect the average investment of others to be larger when they are in rooms with more men, however, these differences are small and not statistically significant.

and actions to the decisions, 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. The effect is large. A woman is 3.5 times more likely to place a dollar in a lottery when surrounded by men compared to when she is surrounded by women.

Our finding is consistent with research showing women are more likely to conform than men (Bond & Smith, 1996). Women are paying attention to their surroundings. They may then incorporate 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

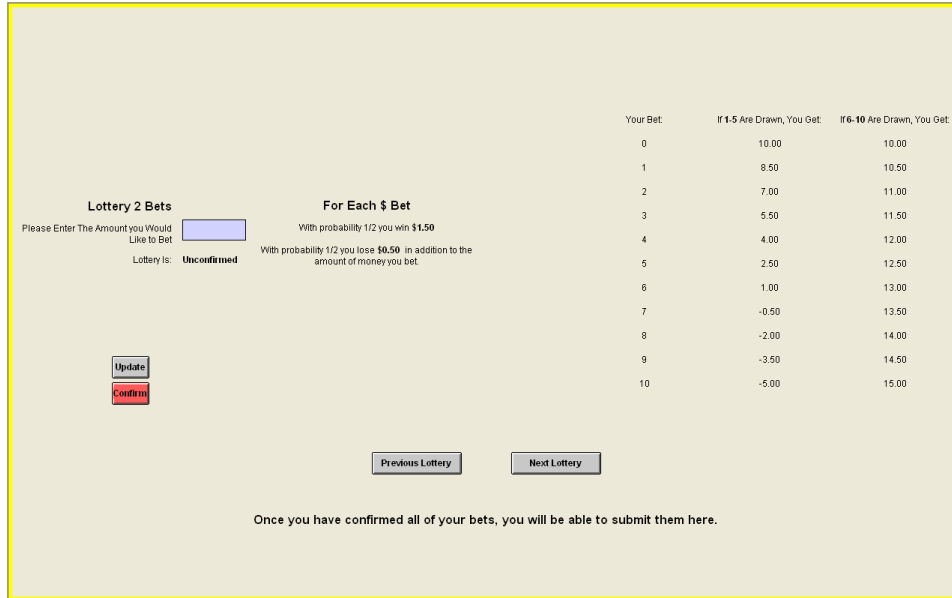


Figure 2: Example Decision Screen for payoffs of \$1.50 or -\$0.50

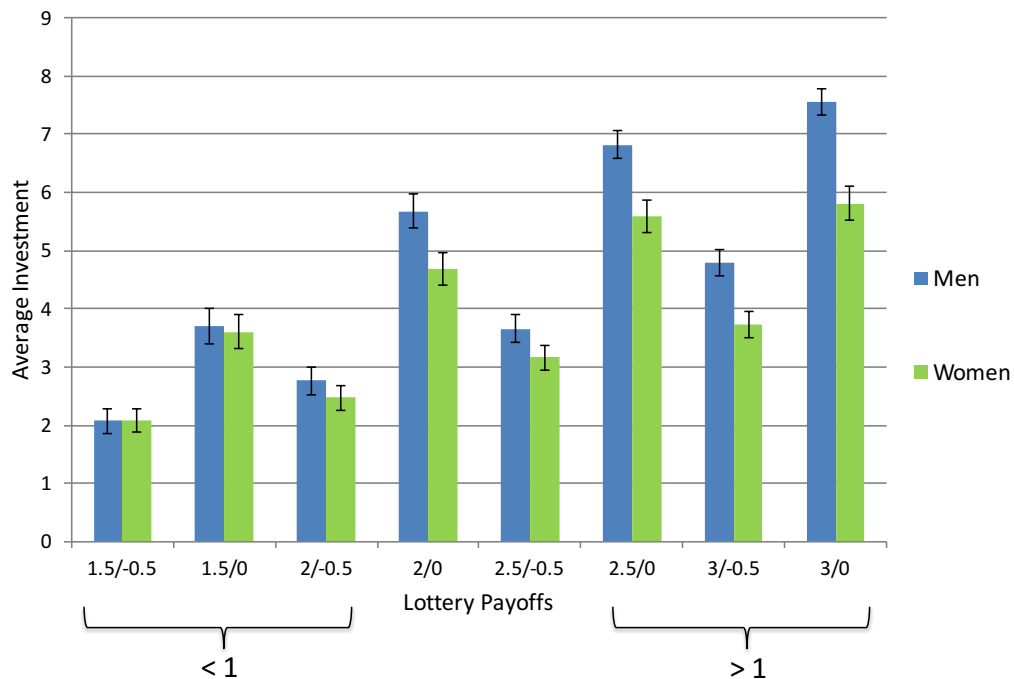


Figure 3: Average Investment by Lottery and Gender (error bars are standard errors of the mean)

**Table 1: Lottery Investment by Room Composition and Gender**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Ordered Logit Invest Women	Ordered Logit Invest Men	Quantile Reg Invest Women	Quantile Reg Invest Men	OLS Zero Invest Women	OLS Zero Invest Men	OLS Ten Invest Women	OLS Ten Invest Men
<b>PANEL A: 8-person sessions</b>								
Proportion of men	1.68* (0.94)	-0.77 (1.00)	3.00* (1.79)	-1.50 (2.21)	-0.43*** (0.14)	0.20 (0.16)	-0.05 (0.13)	-0.08 (0.17)
Observations	936	1,176	936	1,176	936	1,176	936	1,176
Num of participants	117	147	.	.	117	147	117	147
Session FE	YES	YES	YES	YES	YES	YES	YES	YES
Lottery FE	YES	YES	YES	YES	YES	YES	YES	YES
R-squared			0.28	0.35	0.21	0.26	0.15	0.25
Log likelihood	-1968	-2264	.	.	-319.6	-465.2	9.156	-388.3
<b>PANEL B: 6-, 7- and 8-person sessions</b>								
Proportion of males	2.13** (0.94)	-0.14 (0.77)	3.75** (1.70)	-0.00 (2.80)	-0.53*** (0.13)	0.00 (0.14)	0.05 (0.13)	-0.07 (0.13)
Observations	1,272	1,576	1,272	1,576	1,272	1,576	1,272	1,576
Num of participants	159	197	.	.	159	197	159	197
Session FE	YES	YES	YES	YES	YES	YES	YES	YES
Lottery FE	YES	YES	YES	YES	YES	YES	YES	YES
R-squared			0.26	0.35	0.20	0.25	0.15	0.25
Log likelihood	-2670	-3036	.	.	-455.8	-614.7	28.35	-530.6

Panels A and B regressions include standard errors clustered by participant, session-level fixed effects, dummy for each lottery choice, proportion of nonwhites in room and dummy for nonwhite. Panel B regressions also include a dummy variable for 3-person rooms. \*\*\* p<0.01, \*\* p<0.05, \* p<0.10.

**Table 2: Ordinary Least Squares Regressions of Time Taken to Submit Decisions and Number of Clicks Made by Room Composition and Gender (8-person sessions)**

VARIABLES	(1)	(2)	(3)	(4)
	Time to Submit Women	Time to Submit Men	Num of Clicks Women	Num of Clicks Men
Proportion of males	43.73 (50.09)	-44.33 (41.80)	45.36*** (17.01)	-18.95 (22.12)
Constant	315.62*** (21.32)	332.80*** (31.99)	107.90*** (7.24)	147.72*** (16.93)
Observations	117	147	117	147
R-squared	0.01	0.01	0.06	0.01

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

**Table 3: Ordinary Least Squares Regressions of Average Investment, Time Taken to Submit Decisions and Number of Clicks by Behavior of Others in Room and Gender (8-person sessions)**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Avg Investment Women	Avg Investment Men	Time to Submit Women	Time to Submit Men	Num of Clicks Women	Num of Clicks Men
Avg time taken by others	-0.006*** (0.00)	0.002 (0.00)	0.440*** (0.13)	0.629*** (0.09)		
Avg number clicks by others					0.423*** (0.10)	0.683*** (0.12)
Constant	5.731*** (0.62)	4.064*** (0.63)	190.938*** (43.35)	104.809*** (30.01)	70.095*** (12.84)	43.775*** (16.15)
Observations	117	147	117	147	117	147
R-squared	0.08	0.01	0.09	0.24	0.14	0.19

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

# 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.

**Lottery 7 Bets**

Please Enter The Amount you Would Like to Bet

Lottery Is: **Unconfirmed**

**Update**

**Confirm**

**For Each \$ Bet**

With probability 1/2 you win **\$2.00**

With probability 1/2 you lose **\$0.00** in addition to the amount of money you bet.

Your Bet:	If 1-5 Are Drawn, You Get:	If 6-10 Are Drawn, You Get:
0	10.00	10.00
1	9.00	11.00
2	8.00	12.00
3	7.00	13.00
4	6.00	14.00
5	5.00	15.00
6	4.00	16.00
7	3.00	17.00
8	2.00	18.00
9	1.00	19.00
10	0.00	20.00

**Previous Lottery**      **Next Lottery**

Once you have confirmed all of your bets, you will be able to submit them here.

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.

**Lottery 7 Bets**

Please Enter The Amount you Would Like to Bet

Lottery Is: **Confirmed**

**Update**

**Confirm**

**For Each \$ Bet**

With probability 1/2 you win **\$2.00**

With probability 1/2 you lose **\$0.00** in addition to the amount of money you bet.

Your Bet:	If 1-5 Are Drawn, You Get:	If 6-10 Are Drawn, You Get:
0	10.00	10.00
1	9.00	11.00
2	8.00	12.00
3	7.00	13.00
4	6.00	14.00
5	5.00	15.00
6	4.00	16.00
7	3.00	17.00
8	2.00	18.00
9	1.00	19.00
10	0.00	20.00

**Previous Lottery**      **Next Lottery**

Once you have confirmed all of your bets, you will be able to submit them here.

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.

	Your Bet:	If 1-5 Are Drawn, You Get:	If 6-10 Are Drawn, You Get:
	0	10.00	10.00
	1	10.50	9.00
	2	11.00	8.00
	3	11.50	7.00
	4	12.00	6.00
	5	12.50	5.00
	6	13.00	4.00
	7	13.50	3.00
	8	14.00	2.00
	9	14.50	1.00
	10	15.00	0.00

**Lottery 6 Bets**

Please Enter The Amount you Would Like to Bet

Lottery Is: **Unconfirmed**

**For Each \$ Bet**

With probability 1/2 you win **\$1.50**

With probability 1/2 you lose **\$0.00** in addition to the amount of money you bet.

Once you have confirmed all of your bets, you will be able to submit them here.

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.

	Your Bet:	If 1-5 Are Drawn, You Get:	If 6-10 Are Drawn, You Get:
	0	10.00	10.00
	1	8.50	11.50
	2	7.00	13.00
	3	5.50	14.50
	4	4.00	16.00
	5	2.50	17.50
	6	1.00	19.00
	7	-0.50	20.50
	8	-2.00	22.00
	9	-3.50	23.50
	10	-5.00	25.00

**Lottery 8 Bets**

Please Enter The Amount you Would Like to Bet

Lottery Is: **Confirmed**

**For Each \$ Bet**

With probability 1/2 you win **\$2.50**

With probability 1/2 you lose **\$0.50** in addition to the amount of money you bet.

When you are happy with all of your bets, please click the button below to submit.

## 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.