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Trust, Risk and Betrayal

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Using experiments, we examine whether the decision to trust a stranger in a one-shot interaction is equivalent to taking a risky bet, or if a trust decision entails an additional risk premium to balance the costs of *trust betrayal*. We compare a binary-choice Trust game with a structurally identical, binary-choice Risky Dictator game with good or bad outcomes. We elicit individuals' minimum acceptable probabilities (MAPs) of getting the good outcome such that they would prefer the chance to the sure payoff. First movers state higher MAPs in the Trust game than in situations where nature determines the outcome.

Keywords: Trust, risk, dictator game, betrayal cost, experiments

JEL classification: C72, C91, J15, J16

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1. Introduction

"It's a vice to trust all, and equally a vice to trust none." This sentiment—from Seneca's *Letters to Lucilius*—inspired our research on when and whom to trust. Seneca, the great Roman first-century statesman and philosopher, recognized that trust always involves a gamble. Nineteen centuries later, playwright Tennessee Williams noted the distinctive costs of betrayal: "We have to distrust each other. It's our only defense against betrayal."

Today's world of depersonalized investments and purchases by Internet enables us to secure great benefits from specialization, thus catering to particular preferences and providing diversification. But one price of engaging in consequential relationships at a distance is that one must choose to trust strangers. This paper conducts experiments to determine if the decision of whether or not to trust a stranger in a one-shot interaction is equivalent to taking a risky bet, or if trust decisions entail an additional risk premium to balance the costs of *trust betrayal*.

To differentiate between risk preferences and possible betrayal costs as factors in decisions, we employ a novel design for trust experiments.[1] We compare a binary-choice Decision problem, where nature determines the outcome if people decide to trust, with a binary-choice Trust game offering the same setup and payoffs.

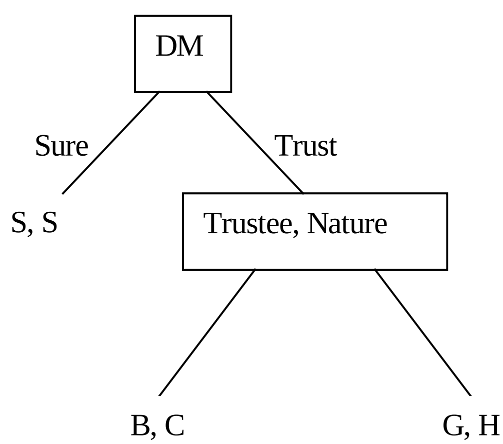
We consider a decision format where a first mover (the Decision Maker, DM) has to choose between *S (sure-thing)* and *T (trust). S* results in a sure outcome S and *T* in a risky outcome that can be either G (good) or B (bad) for the DM. The DM's preference ordering is G > S > B. We first consider the decision when the chance outcome after *T*

[1] For related designs focusing on behavior in the ultimatum game, see Blount (1995), Bolton, Brandts and Ockenfels (2000) and Pillutla and Murnighan (1996).

involves a lottery. We then see what happens when the outcome after *T* is determined by a second mover (the Trustee), whose payoffs at B, G, and S, are respectively C, H, and S, with C > H > S. (For mnemonic purposes C pairs with B and H with G. See Figure 1.) This ordering implies that the Trustee would prefer that the DM pick *T*. However, if *T* were picked, since C > H, the Trustee would have the temptation to "betray" and select B, making the DM worse off than had he chosen *S*.[2] Presumably some individuals are trustworthy and pick G; others are not and choose B. Our central question is whether a DM merely makes a probabilistic assessment of trustworthiness, and then acts as if he were choosing between a certainty and a lottery, or whether the need to trust introduces additional elements. That is, do the prospects for betrayal influence the DM's decision?

Figure 1: Monetary payoffs in the Decision problem and the Trust game

(First payoff to DM, second to Trustee)



[2] For clarity, we treat the first mover as male and the second mover as female.

A large body of work on trust, crossing many disciplines, assumes that the willingness to trust is closely associated with the willingness to take risk (for example, within economics see Ben-Ner and Putterman 2001; within philosophy see Luhmann 1979; within sociology, see Cook and Cooper 2003).[3] Empirical evidence, however, is mixed. Results seem to depend on the measurement procedure used. Eckel and Wilson (this volume) find that subjects' self-reported risk attitudes (or "sensation seeking" as measured by the Zuckerman Scale) influence the trust decision in a simplified version of the investment game (Berg et al. 1995), but subjects' revealed risk preferences for financial stakes do not. Ashraf et al. (2003) also do not find any relationship between risk preferences revealed in a risky-choice tasks and trust decisions in the investment game.

Snijders and Keren (1998) measure risk directly in a trust game similar to ours. They define risk as (S-B)/(G-B), which gives the probability of earning G that makes a risk neutral person indifferent between trusting and not trusting. Varying the payoff structure, the authors find that the risk ratio strongly affects trust. In addition to risk, the willingness to trust is also influenced by "temptation," (C-H)/(C-B), a measure of the Trustee's incentive to betray trust.[4]

While an attractive design, the risk preferences measured by Snijders and Keren (1998) are influenced by the fact that risk is evaluated in the context of a Trust game. Risk taking may be influenced by the DM's expectations of trustworthiness (or expected

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[3] See also the recent survey of trust experiments by Camerer (2003). Hardin (2002) critically discusses the approaches that equate trust with a gamble or a risky investment.

[4] They find that subjects with an organ donor card also trusted more, suggesting that trust is also related to other-regarding preferences (which is corroborated by the findings by Ashraf et al. 2003 and Cox 2003).

“temptation”), and by the fact that it is not nature but another person who decides whether the DM will earn B or G. In contrast, the instruments used to measure risk preferences in the studies by Ashraf et al. (2003) and Eckel and Wilson (this volume) seem to be quite removed from the Trust decision, involving choices between lotteries whose payoffs differ from the payoffs used in the Trust game. Most importantly, the typical choice task in a risky decision experiment does not involve a second person. Rather, the first mover’s choice affects only his own payoffs and does not lead to potential payoff differences between him and a second person. We address these issues in our design.

We start with a standard risky-choice task, the *Decision problem (DP).* For it, we elicit people’s minimum acceptable probabilities (MAPs) of earning G for which they would just prefer the gamble to the sure payoff S. We inform subjects that prior to the experiment we determined a probability, p*, of receiving G. If their MAP is higher than p*, they will earn S. However, they will play the gamble with probability p* if their MAP is lower than or equal to p*. The higher one’s MAP, the higher p* must be for the person to choose *T* over *S*. Thus, the less one likes one or both outcomes in *T*, the higher will be one’s MAP. This mechanism is incentive compatible, i.e., a rational DM should be indifferent between S and the gamble with the reported MAP, since individuals cannot affect the probability they receive in the lottery.[5]

[5] This is equivalent to asking a consumer her willingness-to-pay for a good, with the understanding that the good will be purchased at the market price if the market price turns out to be lower than the stated price. She has no reason to misrepresent. This is a theoretical argument. We cannot exclude the possibility that our elicitation procedure affects behavior differently than, for example, a standard choice task. Boles and Messick (1990), for example, found that people sometimes regret the consequences that result when such minimal thresholds are implemented.

Our procedure is closely related to the Becker-DeGroot-Marshak elicitation procedure. The principal difference is that we do not generate p* randomly from a uniform distribution. In the Trust game, p* depends on the distribution of Trustees' actions. Given our procedure, truth-telling is as good as anything else. It is strictly dominant—the accomplishment of the Becker-DeGroot-Marschak mechanism—if subjects subjectively assign positive probability to values of p* in the immediate neighborhood of their MAP. Potential differences in subjective probability distributions in the three decision situations do not matter as long as this condition is satisfied.

Our goal is to compare the Decision problem to the Trust game. However, the Trust game has an additional element beyond the Decision problem: payoffs go to two players, the DM and a second person. To reproduce this element apart from a trust situation, we developed a second treatment, the *Risky Dictator game*. In it, the DM's choice affects a Recipient's payoffs as well as his own. The Recipient is merely that; she makes no decision. As before, the DM can take a sure payoff, S, or take a chance between G and B. The probability of earning G is p*. His choice, and the outcome of the gamble if taken, determines the Recipient's payoff. The Recipient receives S if the DM chooses *S*. If the DM chooses *T*, the Recipient gets H or C, where C > H > S (see Figure 1).

The Trust game, which we compare to the Risky Dictator game, offers the same payoffs for the DM as both the Decision problem and the Risky Dictator game. It has the same payoffs for the Trustee as the Risky Dictator game has for the Recipient. The critical difference for the Trust game is that if *T* is chosen, another player, the Trustee, not nature, determines the outcome. The Trustee prefers the outcome at B to that at G, whereas the DM prefers G. The probability of earning G is p*, which is determined by the fraction of Trustees who reward trust. To determine the value of p* experimentally, we ran the Trust game first and then employed the identical p* in the Decision problem and the Risky Dictator game.

If DMs care only about their own payoffs and the probabilities of securing them, the MAPs in all three games should be the same. However, concerns about payoffs to others could create a wedge between the MAPs in the Decision problem and the Risky Dictator game. Recent theoretical models and much empirical evidence suggest that the DM may be motivated by altruism (Andreoni and Miller 2002), efficiency gains to the dyad (Charness and Rabin 2002), or concerns about disparities in payoffs (Fehr and Schmidt 1999, Bolton and Ockenfels 2000). Fehr and Schmidt (2001) survey the evidence. For the numerical payoffs we employed, altruism and efficiency preferences increase the attractiveness of the gamble in the Risky Dictator game compared to the Decision problem. This would lead to lower MAPs in the former than in the latter. By contrast, inequality aversion makes the gamble less attractive, inducing higher MAPs in the Risky Dictator game than in the Decision problem. The net influence of the two effects is unclear, and would presumably depend on the size of the payoffs.

Our main interest is in the differences in decisions taken in the Trust game and in the two other games. Our principal hypothesis is that it is fundamentally different to trust another person than to rely on a random device that offers the same outcomes: people are averse to being betrayed.[7] Betrayal aversion is in line with recent theoretical models and

[7] Although people may dislike being betrayed for individualistic reasons, their feelings could be reinforced through their understanding of the special significance of trust in society, as one of the referees noted. In a recent issue of *Science*, Martin Nowak and Karl Sigmund (2000) called trust and reciprocity the "basis of

empirical evidence that people care about how outcomes came to be, or others' intentions (Rabin 1993, Charness and Rabin 2002). Thus, we conjecture that we will see higher MAPs in the Trust game than in the Risky Dictator game. We also hypothesize that such differences in MAPs apply to all demographic sub-groups. Even though some groups may be more risk averse or less likely to trust than others, we expect betrayal aversion to be a universal phenomenon. This paper tests main effects and controls for differences between various demographic sub-groups.

Our paper is organized as follows: Section 2 presents the central hypothesis, and Section 3 the details of the experimental design. Section 4 reports the results, and Section 5 concludes.

2. Central Hypothesis

Our central hypothesis is that individuals incur an additional, non-monetary loss when their trust is betrayed by their Trustee. This will make them more reluctant to take a chance on another individual being trustworthy, as opposed to taking a chance on a random device. We measure this effect by comparing MAPs across games.

Consider an individual with von Neumann-Morgenstern preferences choosing between *S* and *T* for the Decision problem described in the Introduction. He attaches utilities to the three outcomes, denoted as U_S, U_G and U_B. His MAP will satisfy the equation

$$U_S = MAP(U_G) + (1\text{-}MAP)\ U_B\ . \qquad (1)$$

Solving for MAP, we have

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all human systems of morality", and Sissela Bok (1978: 31) argued that "whatever matters to human beings, trust is the atmosphere in which it thrives."

$$\text{MAP} = (U_S - U_B)/(U_G - U_B). \qquad (2)$$

Note that this formulation is general, and can allow for a payoff to another player. Thus, it applies to the Risky Dictator (RD) and Trust games (Trust), not merely the Decision problem (DP).

Our principal conjecture is that when a DM gets the bad outcome in the Trust game—when his trust is betrayed—there is an additional negative element. We call this a *betrayal cost*. This implies that

$$U_{B(Trust)} < U_{B(RD)}, \qquad (3)$$

even when the monetary payoffs are the same in the two games.[8]

What happens to MAP as U_B falls? A falling U_B makes the gamble less attractive, implying that MAP will have to be raised if the decision maker is to remain indifferent between *S* and *T*.[9] Hence, our theory predicts that individuals will have a greater MAP for the Trust game than for the Risky Dictator game, although the payoffs are identical: $MAP_{Trust} > MAP_{RD}$.

3. Experimental design

We employ three treatment conditions to test for the role of betrayal aversion, a Decision problem (DP), a Risky Dictator game (RD) and a Trust game (Trust). The games have identical payoffs for the Decision Maker (DM). The Risky Dictator game and

[8] We assume that U_S and U_G are the same in the two games. We will further discuss different assumptions for U_S below. $U_{G(Trust)} > U_{G(RD)}$ if people derive an additional benefit from having trust rewarded (an "honor reward") that exceeds the utility from a good outcome produced by chance. If honor rewards matter, betrayal costs have to be larger to lead to our prediction: $MAP_{Trust} > MAP_{RD}$. We observe net outcomes in our experiments only. They could be due to betrayal costs or to a combination of betrayal costs and honor rewards.

[9] The derivative of MAP with respect to U_B is negative as $U_S < U_G$: $dMAP/dU_B = (U_S – U_G)/(U_G - U_B)^2$. This implies that a falling U_B increases the MAP.

the Trust game have a second player, called respectively Recipient, and Trustee. In our experiments, S=10, G=15, B=8, H=15, and C=22. The payoffs were presented to subjects in a matrix form with neutral terminology. (See Table A.1 in the Appendix.) Payoffs were given in points, which were converted 1:1 into US dollars at the end of the experiment.

Our experiments were run in the experimental laboratory of the Harvard Business School. Participants were recruited by advertisements in student newspapers in the greater Boston area. 145 people participated, 25 DMs in the Decision problem, 29 pairs in the Risky Dictator game, and 31 pairs in the Trust game. We first ran the Trust game in two sessions, then the Decision problem in one session and the Risky Dictator game in two sessions. Subjects earned a $10-show up fee and received on average an additional $13 for an experiment that took approximately 30-40 minutes.

We did not inform any of our subjects on the value of the probabilities involved in the risky choice but asked them to indicate their minimum acceptable probability (MAP) of earning G such that they would be willing to accept the gamble rather than the sure outcome. If their MAP was higher than a predetermined probability, p*, they were taken to reject the chance outcome. They were paid the sure payoff. If their MAP was lower than or equal to p*, we conducted the lottery (DP and RD) or let the Trustee decide (Trust). The lower one's MAP, the more one is willing to take the risk.

The value of p* was established by the fraction of Trustees who chose to reward trust in the Trust game in the first two sessions. Though it was not necessary for the experiment, the payoffs were selected (and pre-tested in classroom experiments) so that the expected fraction of trustworthy Trustees would be close to the value of p that makes a risk neutral player indifferent between choosing the sure outcome or the gamble, which implies a 0.285 chance of G. In the first Trust experiment, 4 out of 14 Trustees rewarded trust (p=0.286) and in the second session, 5 out of 17 Trustees rewarded trust (p=0.294), or p=0.290 overall. In practice, we set p* = 0.29 by having 29 white marbles in an urn of 100 marbles.

In the Decision problem and the Risky Dictator game, we informed DMs that p* had been determined before they made their decisions. The value of p* was written on a piece of paper and sealed in an envelope that everyone could see taped to the blackboard.

The Trust game required a different treatment for p*. We asked Trustees whether they would pick G if the DM selected *T*.[10] We asked DMs, who were assigned Trustees at random, what minimum percentage of trustworthy behavior (MAP) they would require to select *T*. If the percentage of trustworthy Trustees in their experiment was equal to or exceeded their MAP, we informed them of this, and the two payoffs were decided by whether their Trustee then chose G or B. Otherwise, we informed them that the percentage of trustworthy Trustees in their experiment was lower than their MAP, and thus they would earn the sure payoff of 10.

Each session was organized as follows:

1. *Description of the game and the rules of conduct (identical for DMs and second movers for games that involve both).*
   The payoffs were presented and described both in writing and orally to establish common knowledge. Subjects were informed that this was a one-shot interaction, that, except in the DP, they were randomly matched with another person present in the room, that they were identified by code numbers only and would remain anonymous.

2. *Explanation of decisions (different for DMs and second movers).*
   The DMs and the second movers were given different sets of instructions, detailing their own decision. They were not informed on the exact wording of their

[10] That is, we used the strategy method for Trustees. This method has been found to produce similar results in the investment game as standard experimental choice procedures (e.g., Ashraf et al. 2003).

counterpart's decision. Most importantly, Trustees were not informed that DMs were asked to state their MAP of being paired with a Trustee who rewards trust since we did not want Trustees to try to influence p*. DMs knew that Trustees were neither informed on p* nor that their actions would determine p*.

a. DMs were asked in the three games:
   Trust: "How large would the probability of being paired with a Person Y who chose option 1 have to be for you to pick B over A?"
   DP and RD: "How large would p have to be for you to pick B over A?"
   In all treatments, they were toldd that if their p is lower than or equal to p*, they would play the gamble, and if it was higher than p*, they would earn S.
b. Second movers were asked (Trustees in Trust, Recipients in RD and no second mover in DP)
   Trust: "Which option, 1 or 2, do you choose in case B?"
   RD: "Please wait until your counterpart has made a decision."

3. *Quiz*
   We tested whether DMs understood the task and made sure that everyone had answered the test questions correctly before continuing.[11]

4. *Decision making*
   Trust: DMs and Trustees made their decisions simultaneously.
   DP and RD: Only DMs had a decision to make.

5. *Information on p* and its implications for each subject*
   We informed everyone on the details of the decision procedure and on p*.

   Trust: Here p* was the fraction of Trustees who had chosen to reward trust in their session. If p* was greater than or equal to a DM's MAP, his Trustee's decision determined the outcome. If p* was less than her MAP, he got the sure outcome.

   DP and RD: We opened the envelope and informed subjects that p*=0.29. If p* was greater than or equal to a DM's MAP, he got the gamble.[12] If p* was less than his MAP, he got the sure outcome.

6. *Questionnaire and payment*
   Subjects completed a questionnaire (see Table A.2 in the Appendix) while we put their earnings in sealed envelopes marked with their code numbers. Subjects collected their earnings by presenting their code numbers.

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[11] We presented a number of hypothetical scenarios to DMs, covering the whole range of possible p-values, such as: Assume that your p=0.05 and p*=0.1. Will you participate in the lottery or not? In each session, there were 1 to 3 DMs who did not understand the game in the first attempt. We corrected their mistakes, gave the corrected quiz back, and asked them to answer more questions. We proceeded with the experiment once everyone had answered a set of three questions correctly.

[12] We conducted the lottery as follows: We put 29 white and 71 black marbles into a bowl. For each first mover with p*≥ MAP, we pulled a ball from the bowl (and then replaced it). We informed the subjects for which code number we were conducting the lottery. If the marble was white, they (and their Recipient in the Risky Dictator game) earned G. If the marble was black, they earned B (and their Recipient earned F in the Risky Dictator game).

4. Experimental Results

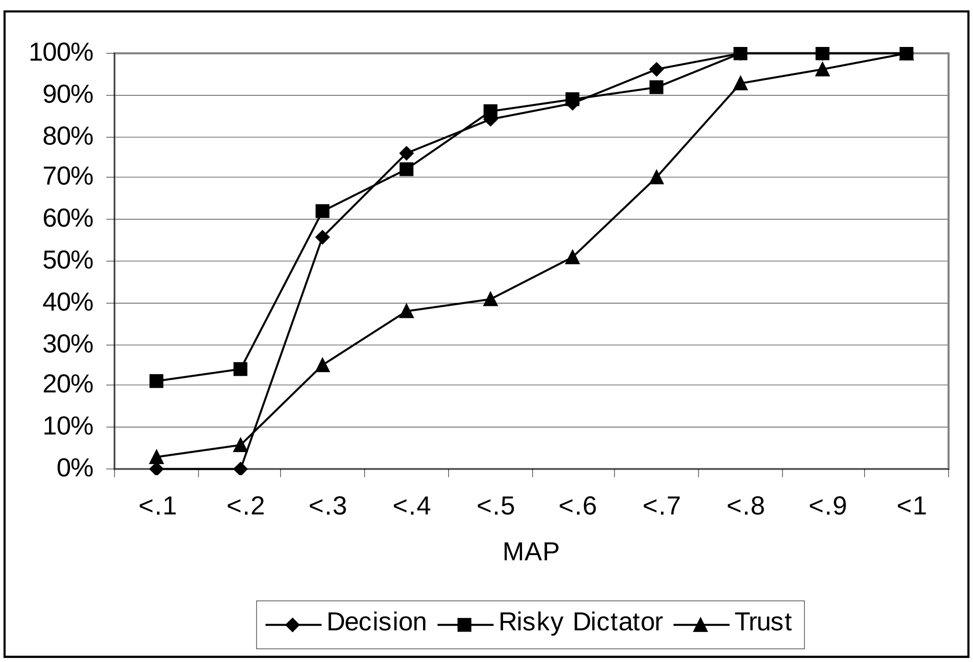
We focus on treatment effects first. We then test for their robustness by including some key demographic variables. Table 1 and Figure 1 summarize our primary findings.

Table 1: MAPs in the three treatments: **means,** medians, *modes*, [N]

	Decision Problem	Risky Dictator Game	Trust Game
Mean	**0.37**	**0.32**	**0.54**
Median	0.3	0.29	0.5
Mode	*0.29*	*0.29*	*0.75*
N	[25]	[29]	[31]

The overall pattern is clear. MAPs are much higher in the Trust game than in the Risky Dictator game (or in the Decision problem). In contrast, MAPs in the Risky Dictator game do not seem to differ from the MAPs in the Decision problem. The figure below shows the complete distribution of values for the three conditions.

Figure 1: Cumulative distributions of MAP's



We now investigate the significance of those differences.

Result 1:

$MAP_{Trust} > MAP_{RD}$

The mean and median MAPs are noticeably higher in the Trust game than in the Risky Dictator game. A nonparametric ranks test revealed that Trust game MAPs were significantly higher (Mann-Whitney $Z=-3.430$, $p<0.01$).

Our results suggest that the decision to trust is influenced by more than just risk, other-regarding, and efficiency preferences. People care not only about the payoff outcome but also about how the outcome came to be. They behave as though there is a *betrayal cost* above and beyond any dollar losses.[13]

Result 2:

$MAP_{RD} = MAP_{DP}$

The mean and median MAPs are quite similar in the Risky Dictator game and in the Decision problem. A nonparametric ranks test did not identify any significant differences. Our results suggest that a willingness to take a gamble that will definitely benefit another party is not strongly influenced on net by payoff comparisons and efficiency differences.

There is an interesting anomaly in the Risky Dictator game at the bottom end. 28% of the DMs had a MAP less than 0.285, the value that made *T* a breakeven

[13] We discuss below alternative hypotheses that could conceivably produce the observed pattern. The difference in MAPs between the trust decision and other decisions may have been magnified because p* is relatively low in the range between 0 and 1.

proposition. Presumably, these individuals were motivated by altruism or by a concern for efficiency.

Our first two results are in line with our principal hypothesis, namely that there are significant *betrayal costs*. Indeed, these costs are sufficient to swamp any *honor reward* for receiving trustworthy behavior and getting G. As a result, subjects need a much higher chance to receive the good outcome to choose *T* in the Trust game than in the Risky Dictator game or the Decision problem.[14]

Result 3: Decision Maker's Choices by Demographic Category

Do our results differ by standard demographic categories? There was little variability in our subject pool in some important categories: All of our 145 subjects were students (76 percent undergraduates), 88 percent were younger than 30, 89 percent were American, 72 percent identified with a religion, and 92 percent ranked themselves in the lower half of the income distribution on a scale from 1 to 6 (see Table A.2 in the Appendix for the questionnaire).

Our sample varied most on gender and ethnicity. 42 percent of our subjects were female, and 33 percent identified themselves as members of an ethnic or racial minority. We focus on these two characteristics. Recent survey evidence suggests that "members of a group that historically felt discriminated against," particularly minorities and women, are less likely than Caucasians or men to report that they "generally trust others" (Alesina and LaFerrara 2002: 207). We examine whether women and minority group members in our experiment had higher MAPs than men and Caucasians, respectively.

[14] The MAP for the Trust game is also significantly greater than the MAP for the Decision problem (Mann-Whitney $Z=-2.696$, $p < 0.01$).

In addition to subjects' own characteristics, their counterparts' attributes could affect their MAPs. In our experiments, DMs were told nothing about their counterparts. Instead, we asked them what an "ideal" Trustee would look like, focusing again on the six characteristics, age, ethnicity, gender, whether someone identifies with a religion, nationality, and economic situation (see Table A.2). Within all categories of respondents, a majority indicates that it trusts all groups.

Focusing on ethnicity/race, 67 percent of our respondents indicate that they trust both Caucasians and members of a minority, 19 percent trust minority members only, and 14 percent trust Caucasians only (see Table A.3 in the appendix). Gender presents a different picture. Only a slim majority of our DMs trusts both men and women (51 percent); 40 percent trust women only; and 9 percent trust men only. The gender attributions of trustworthiness reported here conform to earlier findings on gender-role stereotypic attributions of cooperation and defection in the prisoners' dilemma game. King et al. (1991) found that both genders believe that a male is more likely to defect.[15]

Table 2 gives the principal MAP results separately for each treatment condition, by our demographic groups, and by the groups that subjects trusted. We use subjects' answers to see how inclined they are to be trusting, and whom they are more likely to trust, focusing on race and gender.

[15] While the sample sizes get quite small, we do want to note that the DM's identity seems to affect these assessments: Only 39 percent of the female but 59 percent of the male DMs trust both sexes ($chi^2=2.959$, $p<0.1$). 55 percent of the female DMs trust women only and 30 percent of the male DMs trust women only ($chi^2=4.586$, $p<0.05$). 6 percent of the female and 11 percent of the male DMs trust men only (tests n.a.). Only 45 percent of the minority responders but 76 percent of the Caucasians trust both categories ($chi^2=5.949$, $p<0.05$). 50 percent of the minority DMs but only 6% of Caucasians trust minority members only ($chi^2=17.883$, $p<0.01$). 5 percent of the minority and 18 percent of Caucasian DMs trust Caucasians only (tests n.a.). The in-group bias seems most pronounced among the groups that have traditionally been discriminated against, women and members of minorities.

Table 2. MAPs by Demographic Group, **Mean**, Median, [N]

	Decision Problem	Risky Dictator Game	Trust Game
Men	**0.36** 0.29 [14]	**0.28** 0.29 [16]	**0.50** 0.50 [19]
Women	**0.39** 0.30 [11]	**0.38** 0.35 [13]	**0.61** 0.73 [12]
Caucasian	**0.37** 0.3 [19]	**0.26** 0.29 [16]	**0.51** 0.53 [22]
Minority	**0.39** 0.33 [5]	**0.40** 0.33 [13]	**0.62** 0.70 [9]
Trust both or men*	**0.35** 0.30 [13]	**0.27** 0.25 [19]	**0.49** 0.51 [22]
Trust Women only	**0.40** 0.30 [12]	**0.43** 0.43 [10]	**0.68** 0.70 [9]
Trust both or Caucasian*	**0.37** 0.30 [21]	**0.32** 0.29 [22]	**0.56** 0.63 [29]
Trust Minority only	**0.40** 0.35 [4]	**0.33** 0.29 [7]	**0.33** 0.33 [2]

*We put two categories into one group as our limited data do not suggest any differences between the two and as only very few people trust men or Caucasians only.

We first compare results in the Decision problem. There were no significant differences in the values of MAPs by gender, ethnicity, or the gender of trusted parties.[16] That is, members of these groups were equally willing to take gambles on their own payoffs. If differences emerge in the Risky Dictator game or the Trust game, it will be

[16] We report the results on the ethnicity of the trusted parties here for completeness but we cannot interpret them due to the small sample sizes.

because the groups have different preferences regarding payoffs to others, efficiency, or betrayal.

Looking at the Decision problem and the Risky Dictator game, we find that the MAPs of women, minorities, and those who trust only women do not differ between the two treatments. Men, Caucasians, and those who trust both or only men accept somewhat lower MAPs in the Risky Dictator game than in the Decision problem, implying either some other-regarding preferences or tastes for efficiency.[17] Our results are in line with earlier findings on gender and efficiency preferences. Andreoni and Vesterlund (2001) and Ashraf et al. (2003) find that men respond more strongly to efficiency gains in various non-risky versions of the dictator game than women. While women have generally been found to be more generous (e.g. Bohnet and Frey 1999, Eckel and Grossman 1998), the relative cost of or benefits from giving hardly affect their behavior. The relationship between race and risk, efficiency, and other-regarding preferences has not been studied widely.

Our primary interest is in differences in behavior between the Trust game and the Risky Dictator game. For each of our demographic groups, the MAPs for the Trust game substantially exceed those for the Risky Dictator game with equivalent payoffs. This indicates that each of these groups is concerned with betrayal. While women, minorities, and those who trust women only have higher Trust game MAPs than their complementary groups, only the MAPs of those who trust women only are significantly

[17] For men: Mann-Whitney Z=-1.782, p=0.075; for whites: Mann-Whitney Z=-2.097, p=0.036. Comparing the behavior of men and women, Caucasians and minorities and those who trust both (or men) versus those who trust women only in RD reveals a significant difference for the last comparison only. Those who trust women only have significantly higher MAPs in RD than those who trust both or men (Mann-Whitney Z=-2.316, p=0.021).

higher than the MAPs of those who trust both or only men (Mann-Whitney Z=-2.030, p=0.042).

Past evidence on the relevance of race and gender in trust experiments is mixed. Results depend on the specifics of the experimental design (such as the degree of anonymity between the players), and the country where the experiments were conducted. For a subject pool similar to ours, Glaeser et al. (2000) report that minority and female Harvard undergraduates are less likely than others to trust. Croson and Buchan (1999) find no significant gender differences in trust experiments in the US and various Asian countries. Ashraf et al. (2003) also report no significant gender differences but that minority groups are less likely to trust (the race gap is more pronounced in South Africa than in the United States). In a recent large-scale experiment focusing on gender, Buchan et al. (2003) find that female students are less likely to trust than male students. Eckel and Wilson (2003) are among the few who report a higher trust rate for American women than for men. Generally, demographic variables seem to be more strongly associated with the Trustee's decision of whether or not to be trustworthy than with the DM's decision of whether or not to trust (Croson and Buchan 1999, Chaudhuri and Gangadharan 2002, Cox 2003, Eckel and Wilson 2003).

Result 4: Relative importance of treatment effects and demographic variables

To test more precisely whether our treatment effects are robust and whether the identified sub-population differences indeed matter, we ran an OLS regression on MAPs (see Table A.4). The regressions confirm the differences between the three treatment conditions. Columns 1 and 2 show that the requested MAPs are higher in the Trust game than in the Risky Dictator game but that there is no difference between the Risky Dictator game and the Decision problem. Nonwhite women demand noticeably higher MAPs than everyone else. Their mean requested MAPs are 0.43 in the Decision problem, 0.52 in the Risky Dictator Game, and 0.74 in the Trust game. In column 3, we test whether the gender of the ideal Trustee is related to the requested MAPs, and whether it interacts with a subject's own gender. We find that independent of their own gender, those who trust only women are significantly more reluctant to trust than those who either trust men only or both.[18]

Alternative explanations

Our principal result is that individuals have higher MAPs in the Trust game than in the Risky Dictator game with the same payoffs, or a Decision problem offering the same own payoffs. Such a finding is suggestive of betrayal costs, which make it less attractive to rely on a Trustee than a random device offering the same probabilities. However, in addition to—or in place of—betrayal costs, other elements could enter a DM's utility function. We discuss competing hypotheses here that could conceivably be compatible with our results.

It might appear that the desire to keep in control, rather than the costs of betrayal, could be reducing the attractiveness of the Trust game and lead to $MAP_{Trust}>MAP_{RD}$. The controllability of risk has been identified as an important determinant of risk perceptions and risk taking in risky-choice tasks (e.g., Slovic et al. 1986). We rewrite equation (1) from above to take the cost relating to a loss of control, K, into account:

[18] We have also tested for interactions between the demographic variables and our treatments. As the summary statistics already suggest, neither the gender nor the race interactions are significant.

$$U_{S(Trust)} = MAP(U_G) + (1\text{-}MAP)\ U_B - K. \qquad (4)$$

As the Risky Dictator game does not involve relinquishing control to a second person, equation (4) implies that

$$U_{S(Trust)} > U_{S(RD).} \qquad (5)$$

To compensate for the loss of control when trusting another person, a DM thus would demand a higher MAP in the Trust game than in the Risky Dictator game, which is what we find.

Alternative costs in the Trust game (suggested by one of the referees) include assessment costs (i.e., the cost related to having to assess someone's trustworthiness), costs of making a mistaken assessment, and costs from putting another person into an uncomfortable situation (also leading to $U_{S(Trust)} > U_{S(RD)}$). A final alternative explanation might be that DMs dislike earning money due to another person's kindness (leading to $U_{G(Trust)} < U_{G(RD)}$).

A MAP gives us information on how a DM assesses the risky-choice problem he is confronted with, but not on how he values each possible outcome. Based on our data, we are not able to distinguish whether differences in MAPs are due to different assessments of S or of B and G. However, a number of recent experimental results are compatible with betrayal costs but not with any of the alternative hypotheses. In gift exchange experiments, for example, employers play a trust game with their employees. They have to decide whether to offer a high or a low wage to encourage employees to respond with high effort. Offering a high wage is risky as employees may shirk, but it may also induce fair-minded employees to reciprocate such trust with high effort levels. Several studies have found that employers are willing to pay for the opportunity to punish untrustworthy employees (for a summary, see Gächter and Fehr 2001). Such behavior, we believe, is consistent with betrayal aversion but not with an aversion to losing control, making a wrong assessment, relying on another's kindness or confronting another person with an uncomfortable decision.

5. Conclusions

For thousands of life's risky decisions, be they of the heart or the wallet, from the everyday to the fundamental, trust is a critical ingredient. Economists now recognize that trusting is required if a society is to prosper. Trust has been shown to contribute to economic growth (Knack and Keefer 1997, Zack and Knack 2001), and to enhance some of the factors that promote it, such as judicial efficiency and reduced corruption (La Porta, Lopez-de-Silanes, Vishny and Shleifer 1997).

Trust involves a chance outcome under the control of another party; e.g., will the businesswoman deliver a product of the quality she promised? Some risks effectively involve a lottery process: will the crop be good, will stock X increase in value. Our experimental studies find that individuals are much more willing to take risks when the outcome is due to chance, as opposed to an equivalent-odds situation where the outcome depends on whether another player proves trustworthy. Taking a chance on the latter risks incurring betrayal costs, costs shown to be above and beyond mere monetary losses.

Betrayal costs may contribute to the distinction between intentional and accidental wrongs in both civil and common law. Intentional wrongs are more likely to meet the criteria of criminal conduct and thus, can be punished more severely. In addition, liability for intentional harm cannot be excluded contractually while the parties to a contract can agree to exclude liability for accidental wrongs. Lawmakers seem to understand that people have to be protected more from intentional than from accidental harm. Therefore, incentives have to be in place to keep Trustees from intentionally inflicting harm on Decision Makers. Absent such arrangements, as our results suggest, interactions based on trust may not take place.

Appendix

Table A.1: Payoff tables for the three treatment conditions

Decision Problem

You choose	Type of choice	Probability	Your earnings
A	Certainty	1	10
B	Lottery	p 1-p	15 8

Risky Dictator Game

You choose	Type of choice	Probability	Your earnings	Earnings to Person X
A	Certainty	1	10	10
B	Lottery	p 1-p	15 8	15 22

Trust Game

You choose	Type of choice	Your earnings	Earnings to Person Y
A	Certainty	10	10
B	Person Y chooses 1 2	15 8	15 22

Table A.2: Questionnaire

1. How old are you? ________
2. What is the ethnic group with which you most identify?

   African or African American □ Asian or Pacific Islander □ Caucasian □
   Hispanic □ Native American □ Other □ (Please indicate______________________)

3. What is your gender? male □ female □

4. What is the religion with which you most identify?

   Buddhist □ Catholic □ Hindu □ Jewish □ Muslim □ Orthodox □
   Protestant □ None □ Other □ (Please indicate_________________________)

5. What country are you from (where have you lived most of your life)? _______________

6. Are you currently pursuing studies at the
   undergraduate □ graduate □ Ph.D. □ post-graduate □ level?

7. What is your major? _________________

8. Please indicate your economic situation on a scale from 1 to 6.

   1 2 3 4 5 6
   poor wealthy

9. Which are the characteristics of a person you would trust, assuming that the person has no information about you? (please check all that apply)

   Age:
   Younger than 40 □ between 41 and 60 □ older than 60 □

   Ethnicity:
   African or African American □ Asian or Pacific Islander □ Caucasian □
   Hispanic □ Native American □ Other □ (Please indicate______________________)

   Gender: male □ female □

   Religion:
   Buddhist □ Catholic □ Hindu □ Jewish □ Muslim □ Orthodox □
   Protestant □ None □ Other □ (Please indicate_________________________)

   Country (please indicate): ________________________

   Economic situation:

   1 2 3 4 5 6
   poor wealthy

Table A.3: Percent of DMs indicating that they would trust a specific group [N]

	All DMs	Female DMs	Male DMs	Minority DMs	Caucasian DMs
Ethnicity/race	[N] = 69	[N] = 29	[N] = 40	[N] = 20	[N] = 49
Minority only	19%	14%	23%	50%	6%
Caucasian only	14%	17%	13%	5%	18%
Both	67%	69%	65%	45%	76%
Gender	[N] = 77	[N] = 31	[N] = 46	[N] = 24	[N] = 53
Female only	40%	55%	30%	42%	40%
Male only	9%	6%	11%	17%	6%
Both	51%	39%	59%	42%	55%

Table A.4: Influences on MAPs (minimum acceptable probabilities)

	1	2	3
Decision Problem	0.051	0.069	0.053
	(0.056)	(0.055)	(0.054)
Trust game	0.220 ***	0.237 ***	0.243 ***
	(0.053)	(0.051)	(0.050)
Woman		0.021	0.007
		(0.053)	(0.062)
Minority		0.012	0.009
		(0.063)	(0.061)
Minority woman		0.174 *	0.177 **
		(0.092)	(0.089)
Trust woman only			0.132 **
			(0.060)
Woman trusting woman only			-0.023
			(0.088)
Constant	0.323 ***	0.272 ***	0.238 ***
	(0.038)	(0.048)	(0.050)
Adj R-squared	0.1669	0.2416	0.2911
Observations	85	85	85

Standard errors are in parentheses. All regressions are OLS, clustered for experimental sessions.
* significant at 10%; **significant at 5%; *** significant at 1%.

References

Alesina, A., La Ferrara, E., 2002. Who trusts others? Journal of Public Economics 85, 207-234.

Andreoni, J., Vesterlund, L., 2001. Which is the fair sex? Gender differences in altruism. Quarterly Journal of Economics 116, 293-312.

Andreoni, J., Miller, J., 2002. Giving according to GARP: An experimental test of the consistency of preferences for altruism. Econometrica 70(2), 737-753.

Ashraf, N., Bohnet, I., Piankov, N., 2003. Is trust a bad investment? Working paper. Kennedy School of Government, Harvard University.

Berg, J., Dickhaut, J., McCabe, K.A., 1995. Trust, reciprocity, and social history. Games and Economic Behavior 10, 290-307.

Ben-Ner, A. and Putterman, L., 2001. Trusting and Trustworthiness. Boston University Law Review 81, 523-551.

Blount, S., 1995. When social outcomes aren't fair: The effect of causal attributions on preferences. Organizational Behavior and Human Decision Processes 63(2), 131-144.

Bohnet, I., Frey, B.S., 1999. The sound of silence in prisoner's dilemma and dictator games. Journal of Economic Behavior and Organization 38, 43-57.

Bok, S., 1978. Lying: Moral choice in public and private life. Vintage, New York.

Boles, T.L. and Messick, D.M., 1990. Accepting unfairness: Temporal influence on choice. In: K. Borcherding, O.I. Larichev, and D.M. Messick (Eds.), Contemporary Issues in Decision Making. North Holland, Amsterdam.

Bolton, G., Ockenfels, A., 2000. ERC: A theory of equity, reciprocity, and competition. American Economic Review 90(1), 166-193.

Bolton, G.E., Brandts, J., Ockenfels, A., 2000. Fair procedures: Evidence from games involving lotteries. Working paper, Penn State University.

Buchan, N., Croson, R., Solnick S., 2003. Trust and gender: An examination of behavior, biases, and beliefs in the investment game. Working paper. The Wharton School, University of Pennsylvania.

Camerer, C.F., 2003. Behavioral game theory. Princeton University Press, Princeton and Russell Sage Foundation, New York.

Charness, G., Rabin, M., 2002. Understanding social preferences with simple tests. Quarterly Journal of Economics 117(3), 817-870.

Chaudhuri, A., Gangadharan, L., 2002. Gender differences in trust and reciprocity. Working paper.

Cook, K.S. and Cooper, R.M., 2003, Experimental Studies of Cooperation, Trust, and Social Exchange. In: E. Ostrom, and J. Walker (Eds.), Trust and Reciprocity. New York: Russell Sage, 209-244.

Cox, J.C., 2003. How To Identify Trust and Reciprocity, Games and Economic Behavior, Forthcoming.

Croson, R., Buchan, N., 1999. Gender and culture: International experimental evidence from trust games. American Economic Review 89(2), 386-391.

Eckel, C.C., Grossman, P., 1998. Are women less selfish than men? Evidence from dictator experiments. Economic Journal 108, 726-735.

Eckel, C.C., Wilson, R.K. Is trust a risky decision?, this volume.

Eckel, C.C., Wilson, R.K., 2003. Conditional trust: Sex, race and facial expressions in a trust game. Working paper.
Fehr, E., Schmidt, K., 1999. A theory of fairness, competition, and cooperation. Quarterly Journal of Economics 114(3), 817-868.
Fehr, E., Schmidt, K., 2001. Theories of fairness and reciprocity—Evidence and economic applications. Working paper No. 75, Institute for Empirical Economic Research, University of Zürich.
Fershtman, C., Gneezy, U., 2001. Discrimination in a segmented society: An experimental appproach. Quarterly Journal of Economics 116(1), 351-377.
Gächter, S. and Fehr, E., 2001. Fairness in the labour market—A survey of experimental results. In: F. Bolle and M. Lehmann-Waffenschmidt (Eds.). Surveys in Experimental Economics. Bargaining, Cooperation and Election Stock Markets. Physica, Berlin.
Glaeser, E.L., Laibson, D.I., Scheinkman, J.A., Soutter, C.L., 2000. Measuring trust. Quarterly Journal of Economics 115(3), 811-846.
Hardin, R. 2002. Trust and trustworthiness. Russell Sage, New York.
King, W.C., Miles, E.W., Kniska, J., 1991. Boys will be boys (and girls will be girls): The attribution of gender role stereotypes in a gaming situation. Sex Roles 25 (11-12), 607-623.
Knack, S., Keefer, P., 1997. Does social capital have an economic payoff? A cross-country investigation. Quarterly Journal of Economics, 112(4), 1251-1288.
LaPorta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R.W., 1997. Trust in large organizations. American Economic Review 87, 333-338.
Luhmann, N., 1979. Trust: A mechanism for the reduction of social complexity. In: N. Luhmann (Ed.), Trust and Power. Wiley, New York.
Nowak, M.A., Sigmund, K., 2000. Shrewd investments. Science 288: 819-820.
Pillutla, M.M., Murnighan, J.K., 1996. Unfairness, anger and spite: Emotional rejections of ultimatum offers. Organizational Behavior and Human Decision Processes 68, 208-224.
Rabin, M., 1993. Incorporating fairness into game theory and economics. American Economic Review 83(5), 1281-1302.
Slovic, P., Fischhoff, B. and Lichtenstein, S., 1986, The psychometric study of risk perception. In: V.T. Covello, J. Menkes and J. Mumpower (Eds.). Risk Evaluation and Management. New York: Plenum Press, 3-24.
Snijders, C., Keren, G., 1998. Determinants of trust. In: D.V. Budescu, I. Erev, and R. Zwick (Eds.), Games and Human Behavior: Essays in Honor of Amnon Rapoport, Lawrence Erlbaum , Mahwah, NJ, pp. 355-385.
Zack, P., Knack, S., 2001. Trust and growth. Economic Journal 111(1), 295-321.