Economics Bulletin

Volume 32, Issue 3

Does higher trust lead to higher performance? An experimental investigation.

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Abstract

We investigate experimentally whether higher trust leads to increased performance by relying on simple trust games. Our results show that trust and performance are positively related but not as strongly as suggested in the investment game. As a side result, we observe that the rewards of the subjects'investment decisions are more equally shared than in the standard investment game.

Citation: Mohamed Ali Bchir and Anne Rozan and Marc Willinger, (2012) "Does higher trust lead to higher performance? An experimental investigation.", *Economics Bulletin*, Vol. 32 No. 3 pp. 1873-1877.
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Submitted: February 10, 2012. **Published:** July 10, 2012.

1. Introduction

Recent empirical findings suggest the existence of a positive relation between the level of trust in a society and several economic performance indicators such as GDP, investment, or growth rate. For instance Knack and Keefer (1997) showed that a 10% increase of their trust indicator increases by nearly 1% the growth rate. Several studies found that trust affects the growth rate, GDP per capita and the rate of investment (La Porta *et al.* 1997, Knack and Keefer 1997, Zak and Knack 2001).

So far these studies relied on a measure of *stated trust* such as the one included in the World Value Survey (WVS) questionnaire. The WVS defines trust as the percentage of respondents who answer "yes" to the question: *"Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?*", i.e. choose the answer "can be trusted". But people who state that they would trust do not necessarily act trustfully when they really have to commit to a trusting decision (see e.g. Glaeser et al., 2000). The available evidence raises therefore some doubts about the empirical validity of the relation between trust and economic performance. At best the evidence is based on weak measurements of general trust within a society.

The aim of this paper is to provide an experimental test of the relation between trust and performance, on the basis of two variants of the investment game introduced by Berg et al. (1995). The investment game involves two equally endowed players: the investor and the recipient. The investor can send any amount between zero and his endowment to the recipient. The amount sent by the investor is tripled by the experimenter and earned by the recipient who can decide on the amount to return to the investor. In the investment game, trust and performance are confounded because each unit invested by the investor increases the players' joint payoff which can be taken as a measure of performance. In order to separate trust from performance we introduce an additional step to the investment game by requiring that the recipient moves first. This is achieved by allowing the recipient to transfer some of his endowment to the investor. The recipient's initial move does not generate any surplus for the player pair, but eventually affects the payoff distribution among them. The two remaining stages are the same as in the original investment game: in stage two the investor decides about the level of investment and the recipient receives the tripled amount invested by the investor, and finally in stage three the recipient decides on the amount to return to the investor. Based on our modified investment game we consider two experimental treatments. In one of them, the *IC treatment*, the investor is constrained by his own capital endowment, and is therefore allowed to invest only units of his own capital whatever the amount received from the recipient. In the second treatment, the *RC treatment*, the investor is constrained by the capital that is transferred to him by the recipient. It seems therefore more difficult to reach the group optimum level of investment in the RC treatment than in the IC treatment. In the IC treatment to reach the optimum level of investment requires only that the investor invests his total endowment. In contrast in the RC game, achieving the optimum level of investment requires both that the recipient transfers his total capital to the investor, and that the latter invests all of it.

Subgame perfection predicts that in the stage three the recipient does not return anything to the investor. Therefore in stage two the investor chooses to invest nothing and in stage one the recipient does not make any transfer to the investor. The predicted performance under

subgame perfection is therefore that the joint payoff is equal to the sum of the players' endowments.

In contrast to the standard investment game our modified games have two key features: (i) in order to achieve a higher performance than the subgame perfect payoff both players need to trust each other, and not only the first mover as in the investment game, (ii) the recipient is in a position where he can both trust and reciprocate. Large transfers by the first mover do not necessarily lead to higher levels of performance as in the investment game because the second mover might simply keep the transferred amount to increase his payoff, as predicted by subgame perfection. However, after observing a large commitment by the recipient, the investor may be encouraged to invest a larger amount of his endowment in the IC game. Although the IC game involves exactly the same social dilemma than in the original investment game, the investor has now the possibility to observe the recipient's initial transfer. The investor can therefore condition his level of trust on the observed initial transfer by the recipient. Higher levels of commitment by the recipient may therefore lead to higher levels of investments by the investor. In the RC game, the investor is fully insured to keep his initial endowment and can therefore decide to invest any unit transferred by the recipient without incurring a loss.

2. Experimental design

The experiment consists of two test treatments (RC and IC) and a control treatment (the standard investment game). In the IC treatment the investor is constrained by his own capital while in the RC treatment he is constrained by the recipient's capital transfer. For ease of exposition the recipient will be called *player A* and the investor *player B*. In the IC treatment player A and B both have an initial capital endowment of 10 monetary units. Player A can transfer any amount T, with $0 \leq T \leq 10$ to player B. After having observed the amount transferred to him by player A, player B has to decide on the amount to invest $I \leq 10$. If $I > 0$, player A receives $3I$ and has to decide about the amount $R \leq 3I$ to return to player B. The final payoffs are $y_A = 10 - T + 3I - R$ for player A and $y_B = 10 + T - I + R$ for player B. Note that the joint payoff is equal to $y_R + y_I = 20 + 2I$. This notation clearly shows the key role of the second mover for generating the surplus of the investment like in the investment game. Player A's transfer decision is a pure commitment that has no effect neither on the investment level nor on performance. In contrast, in the RC treatment player B is constrained by the transfer of player A when he decides about his investment level, i.e. $I \leq T$. The players' payoffs are now $y_A = 10 - T + 3I - R$ and $y_B = 10 + T - I + R$ if $T > 0$ and $y_A = y_B = 10$ if $T=0$. Note that player A's decision determines the maximum performance level. But the two games have exactly the same subgame perfect equilibrium: $R = I = T = 0$ leading to $y_A = y_B = 10$.

A total of 120 subjects participated in the experiment which corresponds to 20 player-pairs per treatment. Subjects were randomly assigned to one of two rooms: room A or room B. Once seated, subjects received written instructions that were read aloud. They were told that each one was randomly matched to another player in the other room. A standard double blind procedure was implemented. Subjects were also asked to complete a short questionnaire to check their correct understanding of the instructions and their awareness of the double blind procedure. At the beginning of a session each subject took an envelope marked with a personal code number and containing 10 Euros (in coins). We choose to use real money in the

experiment in order to make subjects more aware of the stakes in play. To avoid any noise signal that could be due to the manipulation of coins, we used a specially designed box for each subject pair containing 40 small (noiseless[1]) partitions in which subjects had to deposit the coins they wanted to send to the player with whom they were paired.

3. Results

Table I summarizes our results. By isolating trust and performance with our test treatments both the level of investment and performance are reduced compared to the baseline: the average level of investment decreases from 5.00 units (baseline) to 4.25 (IC) and 3.25 (RC) and the joint payoff from 30 (baseline) to 28.5 (IC) and 26.5(RC) but this decrease is not statistically significant[2]. But the key result is that we observe a positive correlation between trust (measured as player A's transfer) and performance, supporting previous findings based on natural occurring data. When the investment decision is constrained by the investor's capital (IC treatment) the correlation between the recipient's transfer and the joint payoff is 0.43, a weakly significant relation (Spearman rank correlation, rho=0.42, t=0.06). However when the investment is constrained by the recipient's transfer (RC treatment) the correlation increases to 0.65 and becomes highly significant (Spearman rank correlation, rho=0.50 ; t=0.02).

Another important result (see table I) is that the final payoffs are less unequal than in the standard investment game, where typically the recipient's payoff is twice as large as the investor's (Berg et al., 1995). The isolation of trust and performance induces therefore a less unequal payoff distribution between the two players than in the investment game. In the investment game the investor's average share of the joint payoff represents only 36.3% of the joint payoff, while the recipient receives 63.7%. In contrast in the IC and RC games we observe a distribution of the joint payoff that is close to equal sharing: 56.9% (50.1%) for the recipient and 43.1% (49.9%) for the investor in the IC (RC) game. Furthermore the Gini index[3] is larger in the benchmark treatment (0.16)than in each of our test treatments (IC = 0.09 and RC 0.10) revealing greater fairness when trust and performance are separated and the recipient has to move first.

[1] Since 1 Euro bills do not exist we used 1 Euro coins. We therefore needed to prevent any noise that could have occurred by moving the coins into the box. Such noise could signal something about the amount sent to the other player, and thereby influence other players present in the same room.

[2] The absolute level of performance is not affected when trust and performance are separated. Even though table I shows a slightly lower level of performance on average the difference between the IC-treatment and the baseline is not statistically significant (U=0.90 ; p=0.36), and only weakly significant for the comparison of the RC treatment and the benchmark (U=1.87 ; p=0.06). Besides, the null hypothesis of equal performance in the IC and the RC treatments cannot be rejected (U=1.39 ; p=0.16).

[3] We calculate the Gini index for each player-pair, and then, for each treatment we estimate the average Gini index.

Table I: Summary statistics

Treatments	*Investment game*	*IC*	*RC*
Transfer (T)		4.95	4.90
Investment (I)	5.00	4.25	3.25
Reciprocity (R)	5.65	1.40	1.10
Average joint payoff	30.00	28.50	26.50
Average payoff of the investor	10.65 *(36.3%)*	12.10 *(43.4%)*	12.75 *(49.9%)*
Average payoff of the recipient	19.35 *(63.7%)*	16.40 *(56.6%)*	13.70 *(50.1%)*

4. Conclusion

Our experimental results support the conjecture that trust and performance are positively related in accordance with the empirical literature based on the WVS measure of trust. However our experiment shows that the relation between trust and performance is not as highly correlated strong as suggested in the investment game. We also observe that when trust and performance are isolated the payoff distribution between player A and B gets closer to equal sharing. This finding needs to be examined more carefully. In particular, in the RC game it is puzzling to observe that the second movers decide to invest instead of keeping for themselves the transfer received from the first movers. Obviously, own trust and own reciprocity motives interfere in second movers' decisions, which contrast with the investment game where only own trust matters.

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