The effect of different information disclosures on an experimental hold-up game

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Abstract

In relation-specific investments, investors' choices usually depend on how they envision the receivers' preference. We provide investors with information regarding their partners' performance on ultimatum and trust games. We find that investors make use of the provided information and they have a lower probability of being held up. However, the effects of information disclosure are different across information treatments.

Introduction

When an economic transaction cannot be determined before an investment and the investment is specific to an investee, investors usually find themselves vulnerable and are less willing to make an investment. This "hold-up" problem (Klein et al. 1978[1] ; Williamson, 1975[2] , 1985[3]) is especially true if investors believe that their paired investees are self-regarding. However, it is well documented that both investors and investees can be affected by non-monetary incentives(Berg et al., 1995[4] ; Sloof et al., 2007[5] ; Morita and Servátka, 2013[6] ; Dufwenbrg et al., 2013[7]). Therefore, with information on investees' previous similar games, investors may form more accurate beliefs on the investees' preference and thus make better investment decisions.

This paper investigates how investors use investees' previous game plays to make better relation-specific investments. Because a typical hold-up game consists of an investment stage and a negotiation stage. We provide decompose two games reflecting similar decision scenarios: the first game is an equivalent trust game (Berg et al., 1995[4]); the second game is an ultimatum bargaining game (Güth et al., 1982[8]). In

both the games, investees face the choice of redistributing the same amount of an investment return. However, investors may have different interpretations over investees' strategies, and thus form different beliefs.

Using a lab experiment, we test the effect of investees' previous performance in the two games on investment decisions. We find that previous information on investees' performance lowers investors' holdup probabilities; however, investors tend to over invest in the ultimatum information condition, while their performance is more consistent in the trust information condition.

Experiment design and procedure

Our basic hold-up game follows Morita and Servátka (2013[6])'s three-stage design. An investor (Role A) and an investee (Role B) start with "e" experimental currency units (ECU). In Stage One, the investor decides whether to make a relation-specific investment at a cost of 10 ECUs. The game ends if no investment happens. If investment occurs, it will yield $g(g > e)$ ECU. In Stage Two, the investee decides how to allocate the investment return of g ECU between herself (x ECU) and the investor ($g - x$ ECU). In Stage Three, the investor decides to accept or reject investee's offer. Upon acceptance, she receives $g - x$ and the investee's payoff is $e + x$. If she rejects, her payoff becomes 0 and investee ends with the endowment e. We use the same parameter setting as Morita and Servátka (2013)[6], namely e=10 and g=14, in our experiment. The procedure of the holdup-game is illustrated as Phase 2 in Figure 1.

Figure 1: Information conditions

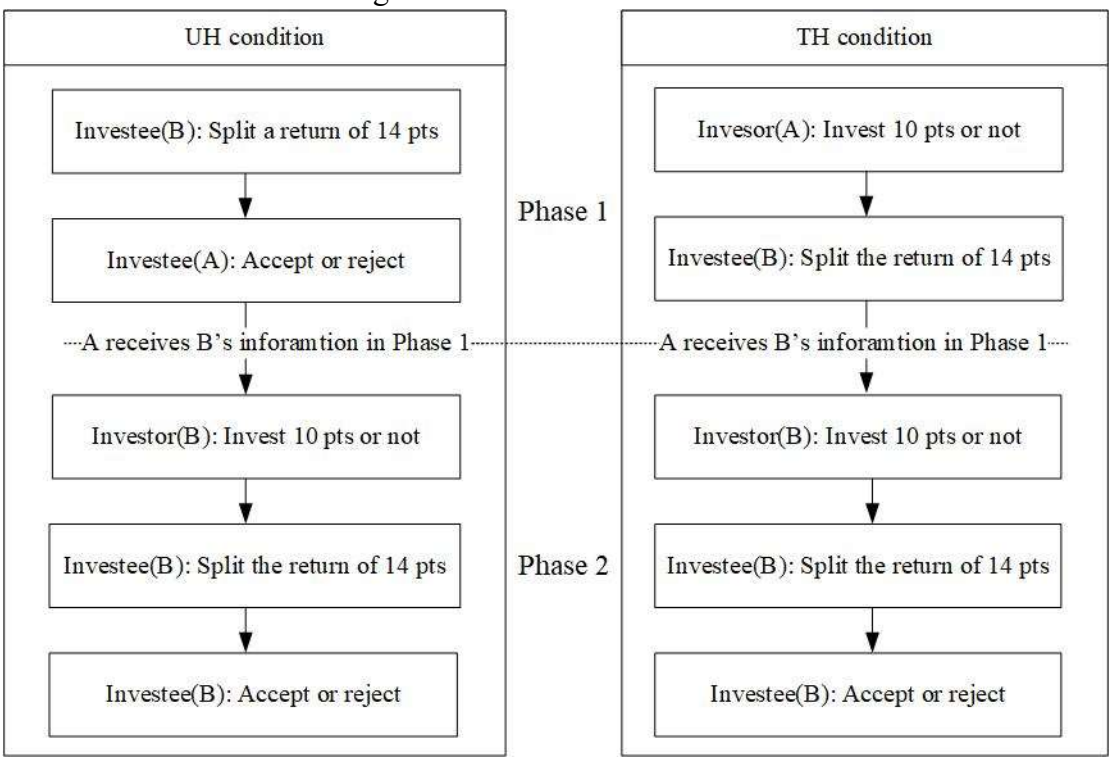

Figure 1 also shows the two information conditions. After removing the investment stage, and conditional on an investee has already received the investment, she will play an ultimatum game (the UH condition) by splitting a return of 14 points. Similarly, after removing the last veto stage, she will play as a trustee in a trust game (the TH condition) by deciding on a similar return of totally 14 points. When investors play a hold-up game at Phase 2, they have additional information on those similar decision tasks about their paired investees. Moreover, to understand players' motivations better, we also elicit each Role B's beliefs on the paired Role A's minimum acceptance threshold after her choice of the transfer.[1]

The experimental instructions are given separately for each phase. The detail instructions of the second phase will be only given later in that phase. In each condition, all subjects are randomly assigned to be role A or B and then randomly rematched in Phase 2 with their roles fixed. We adopt the strategy method to elicit players' contingent

[1] In UH treatment, we collect beliefs in both Phases. In TH treatment, we collect the belief in Phase 2.

choices without given them feedback until the end of the game.[2] The belief elicitation is incentivized in the following way: a perfect prediction results in a three ECU bonus; one or two units' deviation from it results in two or one ECU correspondingly; and more deviations lead to zero bonus. All subjects are required to correctly answer a short quiz about the instructions to ensure good understanding about the game.

The final payoff is drawn randomly from the two phases using the exchange rate of 1:1, in addition to a show-up fee of 15 yuan. At the end of experiments, all subjects are required to fill an exit survey including questions on demographics, risk preference and strategies in the game. We conduct all experiments at University of Electronic Science and Technology of China (UESTC) using z-Tree (Fischbacher, 2007[9]). 168 UESTC undergraduate or graduate students are randomly selected from a subject pool of about 1000 registered students.[3] We have 44 and 40 pairs of subjects in UH and TH condition respectively. Each session lasted about 40 minutes.

Results

While game theoretical prediction with self-regarding players predict that, in both conditions, investees should transfer only the minimum amount, in reality, their transfers are much higher (e.g., Berg et al., 1995[4] ; Güth et al., 1982[8]). For example, in our ultimatum bargaining setting, the average transfer is 7.7 (sd=2.92) and in the trust setting, the average transfer is about 9.7 (sd=3.84). In both information conditions, investors should interpret the paired investees' previous transfer in a similar way. For investors to cover their investment cost (10 ECU), they should invest if the paired investees choose to transfer no less than 10 ECU in the first phase. Table 1 shows the summary statistics. The descriptive evidence is consistent with intuition: because the transfer is lower in Phase One of the UH condition, it witnesses lower investment rate compare with TH condition (Pearson chi-square test, $p \approx 0.111$).

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[2] For example, even the investor chooses not to invest in stage 1; we still ask her whether she wants to accept the following possible transfers, based on a (hypothetical) investment.

[3] The subject pool is managed using "Keyan Assistant"; see https://www.ancademy.org

Table 1: Summary statistics

		UH condition	TH condition
	Number of subject pairs	44	40
Phase 1	Average offer	7.6591	9.7
	Average minWTA	5.1818	--
Phase 2	Investment rate	0.4773	0.65
	Average offer	9.8636	8.775
	Average minWTA	6.8182	6.8
	Acceptance rate	0.8182	0.675

To investigate the different effects of the information disclosure, we provide a more detailed categorization of the investor behavior in the Table 2. The "should" variable in the first column has unit value if the paired partner transfers at least 10 ECU in Phase One. The second column records the observed behavior of investment or not. For the UH condition, investment decision significantly correlates with the information disclosure (Fisher's exact test, $p \approx 0.009$). However, investors also tend to over-invest: half the investors invest when the investment cost is not guaranteed to be covered. All the hold-up occasions are caused by such over-investment. This result reveals possible mixed interpretations of the investees' bargaining choices. In the TH condition, the investment behavior also strongly correlates with the disclosed investees' behavior (Fisher's exact test, $p \approx 0.001$). Investors' reaction is more symmetric, reflecting consistent views on the appropriate transfers.

Table 2: Investors' behaviors

UH condition					TH condition				
Should	Observed	Holdup rate		N	Should	Observed	Holdup rate		N
0	0	30%	36.7%	20	0	0	55.6%	58.3%	9
0	1	50%		10	0	1	66.7%		3
1	0	0%	0%	3	1	0	80%	28.6%	5
1	1	0%		11	1	1	17%		23

Note: Should=1 means investors see previous investees' transfers are greater or equal than 10. Observed=1 if an investment happens. "N" records the number of cases.

The over-investment in the UH condition is worth some further exploration. Recall that at the beginning of ultimatum game, the investor has 0 ECU, the investee has 10 ECUs, and the investee decides how to allocate the revenue of 14 ECUs.

Depending on whether the investee incorporates the unequal initial endowment distribution (Ellingsen and Johannesson (2004)[10]), there are different views of what forms a fair offer can take. For example, without considering endowment, 7 can be viewed as an equal split. Table 3 shows the categorization under the new rule of fairness. However, the new table reports severe under-investment. The asymmetry of the effect on information disclosure implies great complication in interpreting a bargaining setting.

Table 3: Investors' behaviors in UH condition
(should invest threshold >= 7)

Should	Observed	Holdup rate		N
0	0	55.6%	63.6%	9
0	1	100%		2
1	0	7.1%	12.1%	14
1	1	15.8%		19

Table 2 also reports the hold-up rate. Because we use the strategy method, investees' hold-up decisions are recorded disregarding the investor's choice. Given the Phase One transfer supports an investment, the UH condition has 0 possibility of being held up, significantly lower than that in the TH condition (Pearson chi-square test, $p \approx 0.026$). Therefore, generous transfers in a bargaining setting provide a clear-cut signal for investees' cooperative behavior. Moreover, when the information does not warrant an investment, the UH condition still has lower holdup possibility.

The generally superior effect of the bargaining game can be related to investors' investment behavior. After the investment, investees' transfer in Phase Two of the UH condition increase significantly, compared with that in Phase One (Wilcoxon signed-rank test, $p \approx 0.000$). The increased transfer can be explained by both positive reciprocity and investees' beliefs on investors rejection probability. It turns out that the effect of latter dominates, because after accounting for investees' increased prediction of the rejection rates, a signed rank test cannot reject the hypothesis that the adjusted offer is different across Phases (Wilcoxon signed-rank test, P-value ≈ 0.116). This result is

consistent with previous literature that ultimatum bargainers' motivation can be largely explained by strategic considerations (CITE). For investors themselves, their minimum willingness-to-accept also increased significantly (Wilcoxon signed-rank tests, $p\approx0.008$), indicating evidence of expected reciprocity. However, if we keep those who truly invested, the change becomes insignificant (Wilcoxon signed-rank test, $p \approx0.319$).

In TH condition, investors have the (non-credible) veto power in the second phase. Investees lower their offers over the two Phases (Wilcoxon signed-rank test, P-value=0.144). The result implies that investees are not positively affected by such veto power. However, for investors, the investment rate increased mildly (Pearson chi-square, $p\approx0.060$), indicating that investors are aware of their veto power.

Conclusion

In this paper, we study the effects of information disclosures of related games on an experimental hold-up game. We provide investors two types of information when they make a relation-specific investment decision: the paired investee's transfer decisions in an ultimatum bargaining game or a trust game. We find that investors make use of the additional information as predicted. When investors correctly interpret the information, there is a lower possibility of being held up. In the first information condition (UH), investors have expected reciprocity, and investees' beliefs of an increased acceptance threshold lead to higher offers. Investors and investees in second condition (TH) have more consistent views of their partner's previous performance. Yet veto power has little effect in inducing better bargaining proposals from investees.

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