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THE OUTSIDER AND SUNK COST EFFECTS ON 'DANGO' IN PUBLIC PROCUREMENT BIDDING: AN EXPERIMENTAL ANALYSIS

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The Outsider and Sunk Cost Effects on 'Dango' in Public Procurement Bidding: An Experimental Analysis*

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Abstract

This paper presents the result of experiments for finding some insight into an effect of the new bidding system in Japanese public construction works procurement on bidders' collusion, which is called 'dango'. We focused on an effect of the entry of an outsider who is not a dango member. The main conclusion of the experiments is that an outsider, a subject who is not allowed to communicate with other subjects, has a robust effect to prevent other subjects from colluding and to make the winning price decrease considerably. However, we also observed that if all subjects including the outsider had willingness to cooperate and if they could recognize it by using price signaling, they could form tacit collusion and raise the winning price gradually. The result of the experiments implies that a policy to help outsiders such as foreign firms to participate in the bidding may be a crucial countermeasure against dango.

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1. Introduction

The public construction procurement system in Japan has seriously suffered from 'dango', which is collusion among firms who participate in the bidding for the public construction contract as bidders.[1] Prior to the bidding, dango members decide a winner and coordinate their offer prices in a way as to maximize their joint profits.[2] As a result, dango members have obtained excess profits in the public construction works, and Japanese taxpayers have wasted their money. McMillan (1991) estimated that the excess profits from dango in Japanese public procurement typically amounted to 16 to 33% of the competitive price. For example, the amount of Japanese governmental investment is 355 billion dollars in 1998.[3] McMillan's estimation indicates that the excess profits during the year reach to 57 to 117 billion dollars.

Japanese national and local governments have generally adopted 'the designated competitive bidding system' in the public construction procurement since 1900. Under this bidding system, the governments examine whether a firm who wants to submit a bid for the public construction works is eligible for the bidder[4] and make a list of qualified firms. The firms in the list are classified into multiple ranks according to their cost-performance. Each rank is linked to one range of a scale of the public construction works project. At the discretion of the governments, almost 10 firms are designated as bidders from one rank linked to the scale of the project.[5] The winner in a first-price sealed-offer auction with a ceiling price becomes the contractor.

Some previous studies (e.g. McMillan (1991), Woodall (1996), Saijo, Une and Yamaguchi (1996), Une and Saijo (1998)) point out that the designated competitive bidding system has several features that make bidders easy to collude. First, all bidders' costs are almost identical, and all bidders can recognize the fact. The designation of qualified firms from one rank in the list allows all bidders to know that differences of their costs of the public construction works are negligible. Using the information of the costs, bidders may easily compute the excess profit from the bidding and distribute it among them.[6] The second is the small and fixed number of bidders. The number of

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[1] Dango violates Section 3 of the Antimonopoly Act (Prohibition on unreasonable restraint of trade). From 1977 to 1998, Japan Fair Trade Commission reported 130 cases of dango in the public procurement (Japan Fair Trade Commission (1999)).

[2] Various kinds of the price coordination rules by dango have been reported (e.g., McMillan (1991)). The most popular one is that the winner is simply allocated by turn. An alternative rule is that the winner is allocated according to the number of times in the past the firm has participated in the bidding and the size of the firm's bid on the occasions it won a contract in the past.

[3] This number is calculated by using 111.3 yen per dollar, the average exchange rate during 1998.

[4] The governments judge the eligibility by considering each firm's history of contracts for Japanese public construction works, the number of years of experience in Japanese private construction market, location of the headquarters, sales, profit, capital asset, the number of employees and so on.

[5] This means that top-class firms who have the highest cost-performance are not designated as bidders for the small or middle scale projects. Takeda (1994) analyses that this manner may be a kind of an industrial policy to protect small construction firms by preventing higher cost-performance firms from winning in all bids for the public procurement.

[6] We consider a bidder's cost as the private value. However, it may be possible to assume that the cost

bidders the governments designate is fixed at about 10. This reduces conspiratorial transaction costs needed for communication.[7] Third, for foreign construction firms (i.e., outsiders against dango members), it is very difficult to obtain the eligibility for the bidders. This is because their construction works in the past and their numbers of years of experience in Japan are considered as crucial factors in the examination process (Hashimoto (1988)). Fourth, each bidder can identify the others prior to the bidding because the governments usually gather all bidders in a room and hold a meeting to explain a construction works project. Fifth, the governments disclose the winner's name and the winning price after deciding the winner. This procedure may allow dango members to monitor whether other members follow the agreement.[8] The sixth is the need of a guarantee for the public construction procurement contract. In order to contract with the governments for the public procurement, the winning firm has to find other designated firms who guarantee to complete the construction works. If a defector who is one of dango members win in the bidding, the other dango members can refuse defector's request for becoming the guarantee and prevent the defector's completion of the contract. The guarantee procedure may provide a way to punish defectors and neutralize the incentive of dango members to break the agreement (The Society for the Study of Practice of the Public Works Contract System (1999)).[9]

In January 1994, for the purpose of enhancing price competition among bidders, Ministry of Construction introduced a new bidding system, 'the limited general competitive bidding system,' in the extremely large-scale public construction works.[10] The differences between the designated competitive bidding system (the old bidding system) and the limited general competitive bidding system (the new bidding system) are summarized in Table 1. First, the new bidding system prohibits the governments from designating bidders and enables all firms who fulfill certain requirements for the eligibility to participate in the bidding. As a result, it is said that the differences of cost-performance among bidders are magnified and that the number of bidders increases in the actual bidding.[11] These factors may make costs of the conspiratorial negotiation and communication among

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consists of common and private parts. As suggested by McAfee and McMillan (1992), the analysis based on the private-value model can be also applied in this case.

[7] In addition, the designation right is said to be the resource of illegal relationship between officials of the governments and dango members. Using this resource, dango members can not only ask the officials to designate bidders they intended, but also punish defectors by not designating them in the following bidding. This is considered to be one of factors that strengthen dango (e.g., McMillan (1992), Woodall (1996)).

[8] Some experimental result (e.g., Davis and Holt (1998)) reported that capability of monitoring other sellers' actions facilitated explicit price-fixing conspiracy among sellers in the posted-offer auction.

[9] As is well known, the existence of dango is also attributed to some aspects of the structure of the Japanese construction industry and the relationship between construction firms and politicians (McMillan (1991), Woodall (1996)). In this paper, we focus on the aspects of the bidding system only.

[10] The national and local governments have to adopt the new bidding system in the public construction works whose cost amounts to more than 6 million and 21 million dollars, respectively. In the smaller scale projects, the designated competitive bidding system is adopted continuously.

[11] For example, Chubu Regional Construction Bureau, Ministry of Construction adopted the new bidding

bidders increase. Second, the entry of foreign firms into the bidding becomes easier. In the new bidding system, requirements for the eligibility were established in a way that foreign firms were not behind Japanese firms in participating in the bidding.[12] Third, it is more difficult for each bidder to identify other bidders. The governments are prohibited from holding the meeting in which all bidders can identify who participate in the bidding. This suggests that bidders need an additional cost in order to find who will submit bids prior to the bidding. Fourth, the guarantee system for the public construction procurement contract by other designated firms is also prohibited. This may weaken the punishment effect of refusing the defector's request for becoming the guarantee.

Table 1: The Differences between the Old and the New Bidding Systems

	The old bidding system	The new bidding system
Designation of bidders by the governments	Mandatory	Prohibited
Differences of cost-performance among bidders	Negligible	Magnified
The number of bidders predicted	About 10	70 to 80
Entry of foreign firms into the bidding	More difficult than Japanese firms	Same conditions as Japanese firms
Identification of all bidders prior to the bidding	Easy	Difficult
Information of the winner and the winning price	Disclosed	Disclosed
The guarantee system of completion of the construction works by other bidders	Mandatory	Prohibited

It is said that introducing the new bidding system can make it more difficult for bidders to make and maintain dango. Is the hypothesis really true? The theoretical and empirical studies that examine it have not been reported as far as we are aware.[13] It is hard to obtain empirical data regarding dango processes and outcomes since it is illegal. In such a case, the experimental approach provides an interesting opportunity to examine the effects. As an earlier experimental study, Une and Saijo (1998) designed experiments to examine effects of the following two factors on the winning price and bidders' behavior: (i) an increase in the number of bidders, and (ii) the entry of a low cost bidder who had an incentive to break dango. These factors were prepared to examine an impact of prohibition of the designation by the governments. All bidders were allowed to communicate face-to-face with each other. They observed following two important facts. The first is that when all bidders had the same cost, an increase in the number of bidders from 3 to 12 did not significantly

system on a contract for construction of a bridge in Shizuoka City at November 15, 1993. In this bidding, the number of bidders increased from 10 to 21 (Asahi Shinbun (1993)). Ministry of Construction predicts that the number of bidders in the bidding for the national construction works project increases to a maximum of 80 (The Society for the Study of Practice of the Public Works Contract System (1999)).

[12] For foreign firms, each firm's history of previous contracts for the public construction works and the number of years of experience not only in Japan but in foreign countries are evaluated in the examination process (The Society for the Study of the Bidding for the Public Construction Works (1999)).

[13] The only related information we can obtain is the unofficial comment by officials of Ministry of Construction. Asahi Shinbun (1994) reported that they stated that the contract prices of 25 public works projects under the new bidding system decreased 3 percent on average in September 1994.

make the winning price decrease. As a result, the winning price was very close to the ceiling price. The second is that 3 of 5 low cost bidders cooperated with other bidders even though they could surely obtain more profits by defection than by cooperation. The winning price did not decrease considerably. They concluded that both factors were ineffective under the situation in which all bidders were allowed to communicate face-to-face with each other.

The main question posed here is whether the entry of outsiders into the bidding has an effect to break collusion among bidders and to make the winning price decrease considerably. This paper reports a series of laboratory experiments that examine the impact in order to provide some insight into the effect of the new bidding system. We separated 4 subjects (bidders) into 2 groups: one consisted of 3 subjects who were allowed to communicate face-to-face with each other and the other consisted of one subject (i.e., an outsider). Communication between groups was not allowed. Each subject was not informed of the number of all subjects. Under the setting, we conducted the first-price sealed-offer auction with sequential 27 periods. We observed the following conclusions. First, the outsider has a strong effect to prevent subjects from colluding and to make the winning price decrease to near the subgame perfect equilibrium price. Second, if all subjects including the outsider have willingness to cooperate and if they can recognize it by using price signaling, they can form tacit collusion and raise the winning price gradually. In addition, we prepared experiments with a sunk cost that losers have to pay to the experimenters in order to mimic the real situation. From the result of the experiments, we obtained the following third conclusion: although the sunk cost has an effect to strengthen subjects' incentive to defect from collusion through their expectation of the end of the session, the impact is restrictive and does not make the winning price decrease.

The remainder of the paper is organized as follows. Section 2 describes the first-price sealed-offer auctions designed to determine if the entry of an outsider prevents collusion. Section 4 reports the results, and Section 5 discusses the implication of the results and possible future researches.

2. Experimental design

2.1 Characteristics and information conditions in the experiments

In order to focus on the impact of the entry of an outsider, we designed the experiments in such a way not only as to mimic the actual bidding system but also as to simplify the content and procedure as much as possible. We adopted the first-price sealed-offer auction with the following 2 parameters. First, we prepared a parameter of whether subjects were divided into 2 groups or not. In the sessions with two groups, one group consisted of 3 subjects, and the other consisted of one subject. These groups were in separate rooms. While subjects in the same room were allowed to communicate face-to-face with each other, communication between two groups was not allowed. We considered the subject who was not allowed to communicate with the other 3 subjects as an outsider. The second parameter is whether losing subjects pay a fee to the experimenters or not. This

parameter was introduced in order to add an actual aspect of the bidding in the public construction works. In the real situation, it takes various costs for each bidder to prepare for participation in the bidding, e.g., collection of the bidding information, investigation of the public construction works projects, computation of the offer price. If a bidder loses in the bidding, it has to bear the costs without compensation. This is why we use a word of 'the sunk cost' in this paper. Since the sunk cost makes the expected profit smaller, we can observe the effect on the winning price and subjects' behavior. We set –7 as the sunk cost in order to minimize the positive expected profit per period by cooperation with other subjects.[14] In the experiments with the sunk cost, loser's profit in the period was -7.

Table 2: 4 Treatments of the Experiments

Treatments	The number of sessions	The number of periods	The number of bidders	The number of outsiders	The sunk cost
No-Outsider/No-Cost	5	27	3	0	No
Outsider/No-Cost	5	27	4	1	No
No-Outsider/Cost	5	27	3	0	Yes
Outsider/Cost	5	27	4	1	Yes

Our experiments consisted of 4 treatments as shown in Table 2. Commonly in all treatments, the numbers of sessions was 5. Each session consisted of 27 periods. The numbers of subjects in the sessions with and without an outsider were 4 and 3, respectively.[15] Subjects in the same room were allowed to communicate face-to-face with each other in 3 minutes prior to submitting their bids. We assigned all subjects the same unit cost. Although, under the new bidding system, the differences of unit costs among bidders are considered to be magnified, we adopted this setting in order to focus on the effect of the entry of the outsider by simplifying the experimental design.[16]

We designed the following five information conditions on the basis of the actual situation under the new bidding system. First, although subjects were informed of a fact that a final period of the experiments had already been determined, they were not informed of the exact number of periods in all treatments.[17] In the real situation, while all bidders recognize that a series of the bidding with the

[14] Since there is no reference data of the cost for computing the offer price, we set the sunk cost as –7 assuming an extreme case in the experiments. The size of the sunk cost may have an impact on the subjects' behavior. The further research is needed to examine this effect precisely.
[15] The difference of the total number of subjects between the treatments with and without an outsider may make an effect somewhat on the winning price and their behavior. However, as suggested by Une and Saijo (1998), the effect is considered to be negligible.
[16] With regard to the cost structure, Une and Saijo (1998) already conducted the experiments in which there was a difference of unit costs among subjects. They concluded that it did not have an effect to make the winning price decrease considerably.
[17] We instructed subjects about the number of periods as follows: "The experiment will continue until the experimenters say that the experiment has ended. We don't inform you of the number of periods although it has been predetermined." This is the same situation as Isaac and Walker (1985) and Une and Saijo (1998).

same bidders comes to an end some day, no one knows the exact number of the bidding in advance. Second, following an ordinary manner under the Japanese public bidding system, the experimenters did not disclose the losers' offer prices in all treatments. Third, in the sessions with an outsider (the Outsider/No-Cost and Outsider/Cost sessions), the number of subjects were not disclosed to subjects in all treatments. As stated in the previous section, the entry of outsiders makes it more difficult for each bidder to completely identify who will participate in the bidding under the new bidding system. Fourth, the ceiling price assigned by the experimenters was open to all subjects. The ceiling price the governments computed is officially confidential. However, since the price standard of construction materials the governments use is disclosed, it is possible for bidders to predict the ceiling price. A lot of the related studies point out that the actual winning offer prices were very close to the ceiling prices.[18] Fifth, all subjects were informed that they were assigned the same unit cost by the experimenters. We adopted this condition because of making the experiments as simple as possible.

We can examine two effects by comparing these treatments. First, we can examine the effect of the entry of an outsider, 'the outsider effect,' by comparing No-Outsider/No-Cost and No-Outsider/Cost sessions with Outsider/No-Cost and Outsider/Cost sessions, respectively. Second, we can examine the effect of the sunk cost, 'the sunk cost effect,' by comparing No-Outsider/No-Cost and Outsider/No-Cost sessions with No-Outsider/Cost and Outsider/Cost sessions, respectively.

2.2 Procedural details

Let us describe briefly the procedure of the No-Outsider/No-Cost sessions. There were 2 experimenters and 3 subjects in a room. The experimenters instructed how to play the experiment by using a tape recorder.[19] During the instruction, the ceiling price[20] was announced to all subjects. Although the experimenters announced that the number of periods had already been decided, they did not inform subjects of the exact number. Each subject put a plate indicating her/his ID number[21] and unit cost at her/his neck to display for other subjects. After the instruction, subjects had an opportunity to ask any questions about the experimental procedure, and they could do so again to

[18] For example, a survey of major public construction works projects undertaken in the mid-1970s reported that those firms that hired former officials submitted bids that were 99.92 percent of the ceiling prices (Yamamoto (1975)). Related literature (e.g., McMillan (1991), Woodall (1996)) suggested that the ceiling price might be leaked to the bidders, typically via the former officials employed by the bidding firms.

[19] We used a tape recorder to minimize the interaction between the subjects and the experimenters. The content of the instruction by a tape recorder is identical to that of the instruction sheet. We used words of neutral meanings in the instruction. After the instruction, the tape recorder was used to record the conversation among subjects in a manner that subjects could not recognize it. The conversation recorded provided an important resource for the analysis of the subjects' behavior described in the next section.

[20] Since the experiments were conducted during two days, we used different pairs of the ceiling price and the unit cost.

[21] No personal names were used during the experiments. Instead, we assigned an ID number to each subject.

understand the experiment completely after three periods for practice.[22] Subjects were allowed to communicate face-to-face with each other in 3 minutes before each period began.[23] After the time for communication, each subject decided her/his own offer price, which was an integer, wrote it on Report Sheet and put the sheet into a small box in front of her/him. The experimenters collected the sheets and decided the winning price and the winner in the following manner. The winning price is the lowest offer price, which is equal to or lower than the ceiling price, and a subject who submitted it becomes the winner in the period. When multiple subjects submitted the lowest offer price, they cast a die, and a subject whose number is the largest becomes the winner in the period.[24] If the lowest offer price is larger than the ceiling price, no subject becomes the winner in the period. The experimenters announced the winner's ID number and the winning price and wrote them on the blackboard to show them to all subjects. While the winner's profit in the period was equal to the winning price minus the unit cost, the losers' profits were zero. Subjects computed their own profits in the period and wrote it on their Record Sheets.[25] This process was repeated 27 times, and the experimenters announced that the experiment was over after period 27 finished. Subjects computed their total profits and filled questionnaires on their Answer Sheets, in which they answered their strategies of deciding the offer prices, the contents of communication with other subjects and the impression of the experiments and so on. Each subject's earning was proportional to the total profits.

In the Outsider/No-Cost sessions, 3 subjects and an outsider went to different rooms and were separately instructed by the experimenters. Subjects were not informed of the number of subjects. Although the 3 subjects were allowed to communicate each other, they were not allowed to do with the outsider. The other aspects of the sessions were identical to the baseline session. In the No-Outsider/Cost and Outsider/Cost sessions, losers' profits in each period were -7. This information was included in the instruction. The other aspects of the sessions in the No-Outsider/Cost and Outsider/Cost sessions were identical to the No-Outsider/No-Cost and Outsider/No-Cost sessions, respectively.

We conducted a series of the experiments at the University of Tsukuba in December 1994. The total number of subjects was 80, and all of them were inexperienced undergraduate students of the University of Tsukuba.[26] In recruiting them, we did not announced that there were 4 types of the experiments. The subjects consisted of both economics and non-economics majors. In addition, we

[22] Subjects' answers to the questionnaires indicated that almost all (78 of 80) subjects completely understood the rule of the experiments before period 1. The others answered that they did at period 3.
[23] We did not restrict the content of communication except physical threats.
[24] In the actual bidding, when multiple construction firms submit the lowest offer prices, the governments randomly select one of them as the winner (The Society for the Study of the Bidding System (1999)).
[25] Even though a subject looked at the other subject's Record Sheet, she/he could not obtain any additional information because all information needed to compute the profit was given to all subjects in advance.
[26] "Inexperienced' means that the students have not participated in any economic experiments before.

assured that subjects in the same group had not known each other before the experiments. Sessions lasted between 80 and 105 minutes, including the instruction. The mean total payoff was $15.50 per subject.

2.3 Predictions of subjects' behavior

Before the analysis of the result, consider the predictions of subjects' behavior in our experiments on the basis of standard theoretical and experimental results. In all sessions, each subject has one unit capacity and a constant unit cost of C. The experimenters demand one unit at the ceiling price of 15+C. A difference between the ceiling price and the unit cost is fixed at 15. Subjects were informed not of the exact number of periods but of the fact that the number of periods had been already determined prior to the experiments. Thus, the experiments are the finitely repeated first-price sealed-offer auction in which the final period is not clear.

First, consider subjects' behavior in the No-Outsider/No-Cost sessions. Many earlier experimental results indicate that communication among subjects have a robust effect to make collusion.[27] For example, Une and Saijo (1998) conducted the first-price sealed-offer auction experiments under the same setting except the number of subjects. They found that subjects successfully cooperated until the final period in all 5 sessions and that the winning price was fixed at the ceiling price in almost all of periods. These previous results suggest that subjects are likely to make robust collusion in all periods. However, note that there is a probability that some subjects defect in some period before the end of the sessions even though collusion has been successfully maintained in the previous periods. That is, if some subjects feel it sure that the session will be final at a certain period, their optimal strategies are to submit a slightly lower offer price than the winning price predetermined by collusion in the period. The period in which defection occurs depends on each subject's subjective probability that a given period may be the last.

In the Outsider/No-Cost sessions, using the analysis of a partial cartel by McAfee and McMillan (1992), we can interpret this situation as the auction with 2 symmetric bidders who are not allowed to communicate with each other. The subjects' decision-making is a kind of the finitely repeated prisoner's dilemma game. If subjects are informed of a definite final period, it is well known that submitting C+1 in all periods is a subgame perfect equilibrium strategy. However, Kreps *et al*. (1982) show that if there is incomplete information about types of subjects (e.g., purely rational or altruistic) and if subjects believe that others are altruistic or adopt a 'tit-for-tat' strategy, they rationally cooperate in early periods in order to build a reputation for cooperation. This sequential equilibrium reputation hypothesis has been examined and supported by some previous experimental

[27] The fact that communication among subjects has a dominant effect to generate robust cooperation is reported by a various kind of experimental papers. For example, Isaac and Plott (1981) in the double auction, Isaac, Ramey and Williams (1984) in double and posted offer auctions, Isaac and Walker (1985)

studies such as McKelvey and Palfrey (1992) and Andreoni and Miller (1993). For example, Andreoni and Miller (1993) conducted a series of experiments of the finitely repeated prisoner's dilemma game in which a final period was announced in advance. They observed that the subjects were significantly more cooperative than those in a one-shot game in all period except a final one and that an increase in subjects' belief about the probability that their opponent was cooperative enhanced their cooperation. Considering these studies, we can predict that tacit collusion may occur in some sessions if some subjects believe that the other subjects are sufficiently cooperative or adopt a tit-for-tat strategy.

Next, consider subjects' behavior in the No-Outsider/Cost sessions. Basically, the prediction is identical to that in the No-Outsider/No-Cost sessions. However, the sunk cost raises an incentive to defect from the collusive agreement in the final period subjects anticipate. For example, assume that collusion in which all subjects identically submit the ceiling price has been kept from periods 1 to 20. The current period is period 20. In case of the No-Outsider/No-Cost sessions, a subject who strongly feels that period 20 is final can obtain a profit of 14 by submitting C+14. Since the expected profit by submitting the ceiling price is 5,[28] an increase in the expected profit is 9 (=14-5). On the other hand, in case of the No-Outsider/Cost sessions, since the expected profit by submitting the ceiling price in the same situation is 1/3, an increase in the expected profit is 41/3 (=14-1/3), which is larger than that in the No-Outsider/No-Cost sessions. The difference of an increase in the expected profit by the defection may have some effect on subjects' behavior.

In the Outsider/Cost sessions, subjects may behave in the same way as they do in the Outsider/No-Cost sessions. If successful tacit collusion doesn't occur, the winning price decreases to C-6, which is the subgame perfect equilibrium price. Even though tacit collusion occurred, each subject's incentive of defection in a certain period in which she/he believes that the session is final is larger than that in the Outsider/No-Cost sessions.

3. Results

First, we define the dango effectiveness index[29] as $\mu = (p - C)/(p^* - C)$, where p , p^* and C are the winning offer prices, the ceiling price and the unit cost, respectively. The index is a rate of the profit given by the winning offer price to the maximum profit. The index allows us to compare results of the experiments since it doesn't depend on absolute levels of parameters. If the winning prices are equal to the ceiling price C+15, C+1, the unit cost C and C-6, the indexes are 1.0, 0.067, 0.0 and –

in the first-price sealed-bit auction.

[28] If all subjects submit the ceiling price C+15, each subject obtains profits of 15 and 0 with probability of 1/3 (winning) and 2/3 (losing), respectively. The expected profit per period is computed as $(1/3)\times15+(2/3)\times(0)=5$. In case of the sessions with the sunk cost, since a loser's profit is –7 with probability of 2/3, the expected profit per period is computed as $(1/3)\times15+(2/3)\times(-7)=1/3$.

[29] Naming this index, we referred to the index of monopoly effectiveness defined by Isaac, Ramey and

0.40, respectively.

3.1 The No-Outsider/No-Cost sessions

In the No-Outsider/No-Cost sessions except session 1, robust collusion occurred, and the winning prices were equal to the ceiling price in all periods (see Figure 1). No subject broke the collusive agreement. This result is consistent with previous experimental results of Une and Saijo (1998). The answers to the questionnaires of the Answer Sheets and the content of the conversation among subjects indicate that they adopted the following two strategies. The first is that while the predetermined winner submits the ceiling price, the other subjects submit higher offer prices than the ceiling price. As a way to select the winner, the phases-of-the-moon system was adopted. The other strategy is that all subjects submit the ceiling price and that the winner is decided by throwing a die (the identical-offer-price strategy).[30] These are the same strategies as McAfee and McMillan (1992) suggested. As a result, the mean dango effectiveness index throughout the sessions was 0.90.

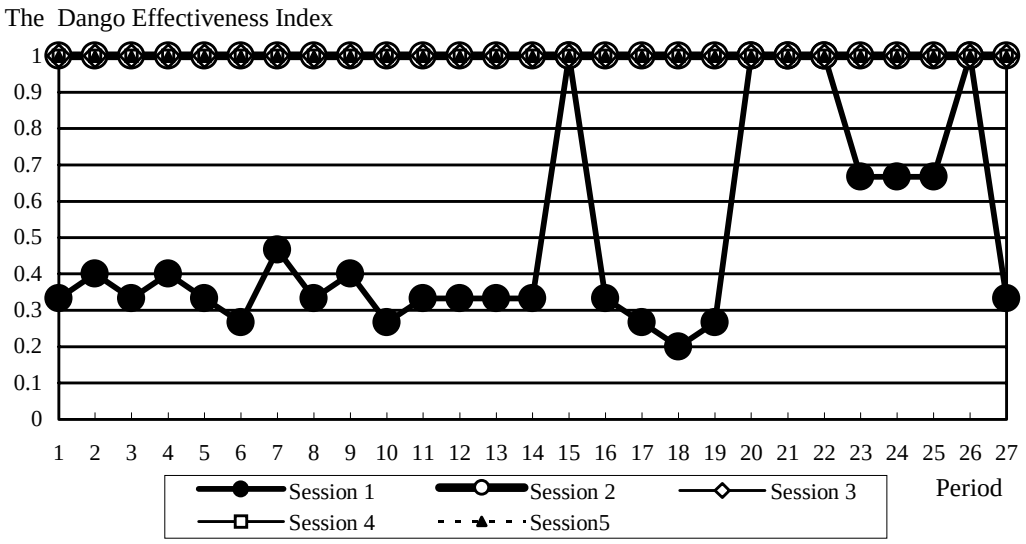

Figure 1: The dango effectiveness index in the No-Outsider/No-Cost sessions

On the other hand, different behavior was observed in session 1. After price competition occurred between 0.2 and 0.5 in the index until period 14, price competition and cooperation were repeated by turns. As a result, the winning price was equal to the ceiling price in only 5 of 27 periods. The content of the conversation and the answers to the questionnaires indicate the following subjects' behavior. From periods 1 to 14, they agreed to freely decide their offer prices. In period 15,

Williams (1984).

[30] While 12 of 15 subjects answered the phases-of-the-moon strategy as the best one to the questionnaires of the Answer Sheets, 3 subjects answered the identical-offer-price strategy.

subject 2 proposed to adopt the identical-offer-price strategy, and the other subjects followed it. After all subjects agreed to freely decide their offer prices from periods 16 to 19, they adopted the identical-offer-price strategy from periods 20 to 22 again. In period 23, they agreed to establish a minimum offer price of 110 where the mean dango effectiveness index was 0.67. Under the limitation of their offer prices, they freely decided their offer prices from periods 23 to 25. After they adopted the identical-offer-price strategy in period 26, they freely decided their offer prices in a final period again.

We summarize these observations as follows:

Observation 1: In the No-Outsider/No-Cost sessions except session 1, subjects completely make and maintain the collusive agreement, and the winning price is completely fixed at the ceiling price.

3.2 The Outsider/No-Cost sessions

The entry of the outsider had a strong effect to stimulate each subject's incentive to compete with other subjects.[31] Figure 2 illustrates the patterns of the dango effectiveness indexes in the Outsider/No-Cost sessions. In all sessions except session 2, price competition occurred, and the winning price decreased to near C+1. On the other hand, in session 2, 3 subjects in the same room raised their offer prices in order to have the outsider raise the offer price. Since the outsider cooperatively responded to this action and lifted her offer price, stable tacit collusion occurred, and the winning price increased gradually. Cason (1995) used a word of price signaling as behavior that subjects posted non-binding offer price for the purpose of communicating with other subjects. The 3 subjects' behavior we observed is considered to be another type of price signaling using binding offer prices. Although the same type of price signaling was also observed in sessions 3, 4 and 5, it could not raise the winning price. These observations indicate that price signaling doesn't always work as an effective tool for generating tacit collusion.[32] The mean dango effectiveness index throughout the sessions was 0.12, which was slightly above the level of the subgame perfect equilibrium price 0.067 (=1/15).[33]

In session 1, 3 subjects in the same room did not communicate with each other throughout the

[31] In Outsider/No-Cost sessions, while no subjects including outsiders answered the phases-of-the-moon strategy or the identical-offer-price strategy as the best one to the questionnaires of the Answer Sheet, 10 of 20 subjects answered submitting C+1 as the best one. In addition, 10 of 20 subjects answered price signaling as a strategy they actually adopted.

[32] This is consistent with the previous experimental results such as Holt and Davis (1990), (1994), Cason (1995) and Davis and Wilson (1999).

[33] We examine whether the mean index (0.12) was significantly larger than 0.067 by using *t* test. The variance of the mean index was 0.026. Since the *t* value was 2.15, we could reject the null hypothesis that the mean index was equal to 0.067 at the 5% significance level for one-tailed test. However, when we excluded data of session 2, the mean index and variance of the other 4 sessions were 0.086 and 0.004, respectively. Since the *t* value under the same hull hypothesis was 0.31, we could not reject the null

session at all. According to the reason of not communicating with each other, subjects 1 and 3 wrote on the Answer Sheets that because there were other subjects in the separate room, they felt that communication was useless. This suggests that the existence of the outsider reduced the subjects' incentive to cooperate with other subjects.

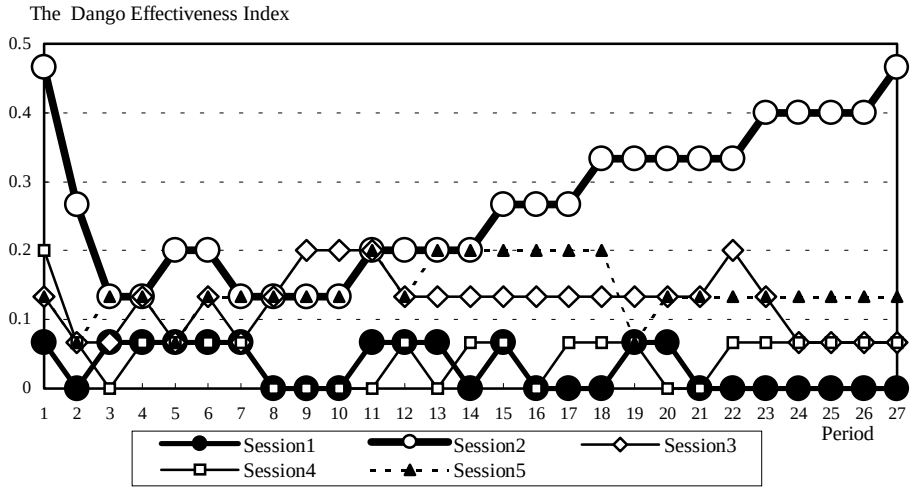

Figure 2: The dango effectiveness index in the Outsider/No-Cost sessions

Next, let us describe subjects' behavior of unsuccessful price signaling in session 4. Figure 3 shows sequences of 4 subjects' offer prices. The ceiling price and the unit cost were 115 and 100, respectively. Although 3 subjects in the same room did not communicate with each other from periods 1 to 13, subject 3 proposed to raise their offer prices in order to stimulate an outsider's willingness to raise her offer price. The other subjects agreed about this proposal, and all subjects raised their offer prices in period 14. However, the outsider did not respond to it cooperatively and kept fixing her offer price at 100 or 101. On the Answer Sheet, the outsider wrote that she thought that the best strategy was to submit 101. This means that the outsider had no idea of cooperation with the other subjects.

hypothesis at the 5% significance level for one-tailed test.

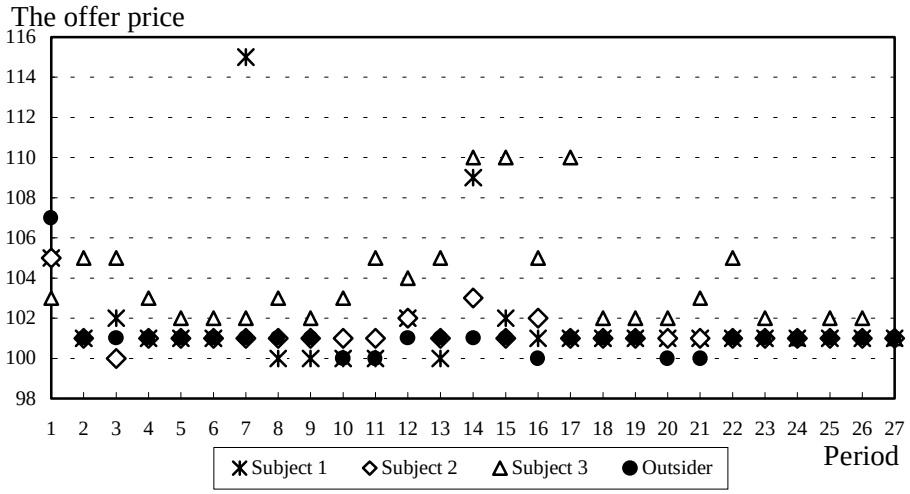

Figure 3: The offer prices in session 4 of the Outsider/No-Cost treatment
(The Unit Cost: 100, The ceiling Price: 115)

In contrast with session 4, price signaling worked effectively and tacit collusion successfully occurred in session 2. Interestingly, as 3 subjects raised their offer prices, an outsider also raised her offer price step by step (see Figure 4). As a result, the winning price increased from 102 to 107. Let us describe the subjects' behavior more precisely. From periods 1 to 10, 3 subjects in the same room agreed to submit much higher offer prices than the unit cost in order to observe which price the outsider would submit. Subject 1 noticed that the 3 subjects in the same room prevented the winning price from increasing because subjects 1 and 3 won at the same offer price 102 in periods 8 and 9, respectively. Subject 1 proposed to submit a higher offer price than 102 before period 11. She said, "If we cooperate to lift our offer prices step by step, the outsiders[34] will win and notice that a minimum of their offer prices is the lowest in all offer prices. Because they must want to win at a higher price, they are also likely to raise their offer prices." Subjects 2 and 3 agreed about this and submitted 104 in periods 15 and 16. The outsider also submitted 104, and the winners were decided by casting a die in these periods. Observing this phenomenon, subject 3 said, "The outsiders didn't cut down their offer prices. They also must have willingness to cooperate and to raise their offer prices." In period 17, since the 3 subjects identically raised their offer prices to 105, the outsider won without changing her offer price. This seemed to make the outsider assure that the other subjects raised their offer prices gradually. After period 18, following the other subjects' offer prices, the outsider also raised her offer price.

[34] The content of the conversation indicates that the 3 subjects seemed to consider that there were several subjects in the separate room. This is because each subject was not informed of the total number of subjects in the sessions with the outsider.

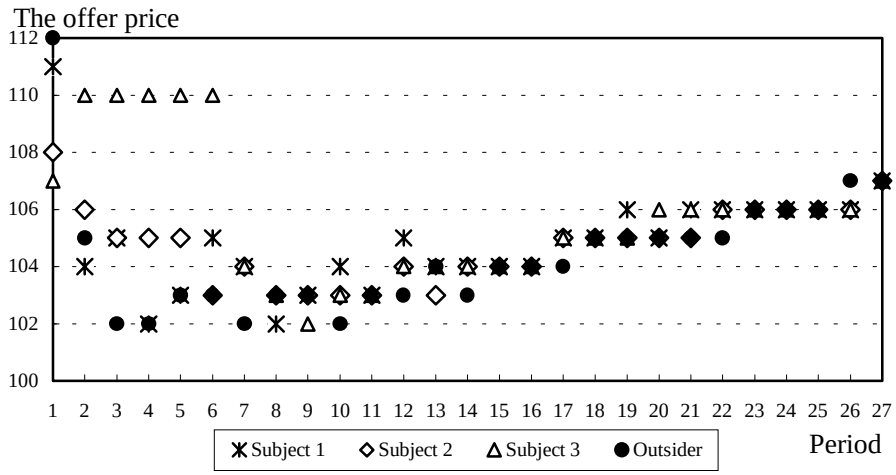

Figure 4: The offer prices in session 2 of the Outsider/No-Cost treatment
(The Unit Cost: 100, The ceiling Price: 115)

From the observation, following three factors seemed to mainly contribute to successful tacit collusion: the first is subject 1's leadership of price signaling. McMillan (1991) suggests that "a dango organizer" who coordinates all aspects of dango has played a critical role in maintaining it.[35] It is considered that subject 1 who played the role of the dango organizer coordinated and integrated the other subjects' behavior. The second is the outsider's willingness to cooperate. On the Answer Sheet, the outsider in session 2 wrote that she wanted to raise the offer price to 110 at least. This answer shows that the outsider seemed to be cooperative while the outsider in session 4 had no idea of cooperation. The third is a price signal as 'a network transmitting subjects' willingness to cooperate.' The price signal was expressed by the movement of the winning price. By simultaneously raising their offer prices, the 3 subjects could not only send their willingness to cooperate but also monitor the movement of the winning price which was the outsider's offer price. If the winning price increases, they assured that the outsider were also cooperative. On the other hand, the outsider could also assure that the other subjects had willingness to cooperate by the movement of the winning price. These processes allowed all subjects to mutually build their reputation for cooperation under the incomplete information about the types of other subjects. It is considered that the cooperative behavior through price signaling in session 2 can also be explained by the theory of Kreps *et al.* (1982) and the observation of Andreoni and Miller (1993).[36]

[35] According to McMillan (1991), the dango organizer sends fax messages to every bidder stating the time and location of the dango conference, keeps track of which bidders have obtained contracts and performs mediation in the event that there is quarreling over which bidder should be assigned to be a winner.

[36] Moreover, as suggested by Kreps *et al.* (1982), the subjects in session 2 may have pretended to be cooperative in order to build a reputation for cooperation. We can interpret the answer of the outsider in session 2 as follows: "If the winning price were above 110, I would submit a slightly lower price than 110." Unfortunately, the end of the session came before the winning price achieved to the level. In order to examine this idea, we need to conduct experiments with more periods.

Moreover, probability of generating successful tacit collusion is 0.2 since it occurred in only one session. Interestingly, this probability is identical to the average probability of cooperation in repeated one-shot prisoner's dilemma experiments reported by Andreoni and Miller (1993).

We summarize these observations as follows:

Observation 2: The outsider has a robust effect to prevent subjects from colluding and to generate price competition. The winning price decreases to near the subgame perfect equilibrium price. However, if all subjects including the outsider are cooperative and if they can recognize it by using price signaling, successful tacit collusion may occur.

3.3 The No-Outsider/Cost sessions

The sunk cost had an effect to loosen the collusive agreement although the impact was much smaller than the outsider effect. In sessions 1 and 5, the defection from the collusive agreement was observed, and the winning price decreased in some periods (see Figure 5). On the other hand, in sessions 2 and 3, successful collusion occurred, and the winning price was fixed at the ceiling price in almost all of periods. Subjects in these sessions decided the winner in each period by using the phases-of-the-moon strategy.[37] In session 4, a different type of collusion occurred, and the winning price regularly deviated from the ceiling price. As a result, the mean dango effectiveness index throughout the sessions was 0.79.

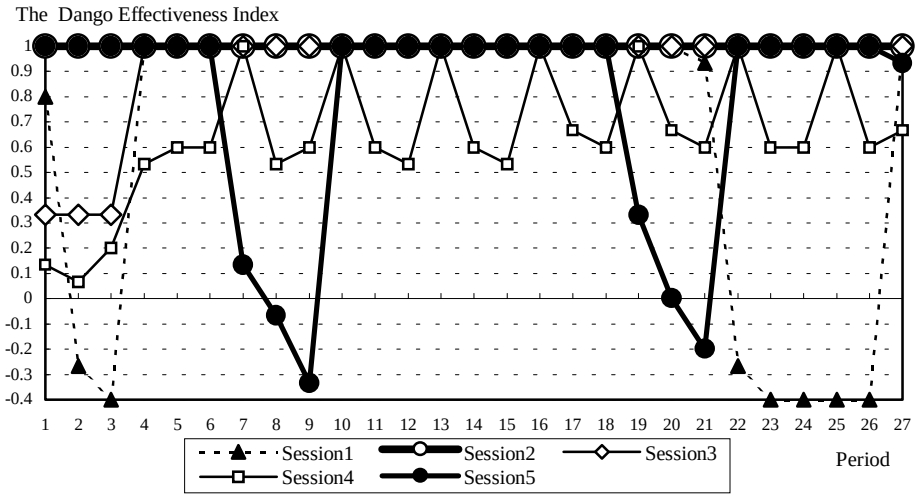

Figure 5: The dango effectiveness index in the No-Outsider/Cost sessions

Let us focus on defective behavior in sessions 1 and 5. The defection was observed in periods 1

[37] In No-Outsider/Cost sessions, while 11 and 1 of 15 subjects answered the phases-of-the-moon strategy and the identical-offer-price strategy as the best one to the questionnaires, respectively.

and 21 of session 1 and period 19 of session 5.[38] First, in period 1 of session 1, although all subjects agreed to submit the ceiling price, subject 3 submitted a slightly lower price. As the reason of the defection, subject 3 wrote on the Answer Sheet that he thought other subjects would submit lower offer prices than the agreed level. This answer indicates that his lack of trust in other subjects caused the defection. Second, in period 21 of session 1, subject 2 broke collusion in which all subjects agreed to adopt the phases-of-the-moon strategy. On the Answer Sheet, subject 2 wrote that since he felt that the end of the session was coming soon, he wanted to win by submitting the slightly lower offer price than the ceiling price. This indicates that subject 2's prediction of a final period caused the defection. Third, in period 19 of session 5, subject 3 broke collusion in which all subjects agreed to adopt the identical-offer-price strategy. She wrote on the Answer Sheet that she did not follow the agreement in order to raise her own profit. From her answer, the change of her behavior from cooperation to defection seemed to be caused by her prediction of a final period. This is because if she did not predict that period 19 was final, her optimal strategy would be to keep following the agreement. Comparing the result of the No-Outsider/No-Cost sessions in which no defection was observed, we can consider that the sunk cost has an effect to generate defection although it seemed to be restrictive.

On the other hand, in session 4, all subjects agreed about the following behavior: while the winner was selected by using the phases-of-the-moon system in every 3 periods (i.e., periods 7, 10, 13,…, 25), subjects competed to win in a range established prior to each period in the other periods. In the conversation among subjects at the beginning of the session, subject 3 told that price competition was more exciting than collusion, and the other subjects agreed to do so.

We can summarize the observations as follows:

Observation 3: Under the no-outsider condition, the sunk cost has an effect to strengthen subjects' incentive to defect from collusion at a specific period in which they believe the session ends. However, the impact on the subjects' behavior is restrictive.

3.4 The Outsider/Cost sessions

A Joint effect of the outsider and the sunk cost also prevented subjects from colluding.[39] Although price signaling caused successful tacit collusion in session 2, price competition occurred in the other sessions. As a result, except session 2, the dango effectiveness index converged on –0.4,

[38] In periods 2, 3 and 22 to 26 of session 1 and periods 19 to 21 of session 5, the subjects could not agree about any collusive actions. In periods 7 to 9 of session 5, all subjects agreed to freely decide their offer prices.

[39] In Outsider/Cost sessions, while no subjects including outsiders answered the phases-of-the-moon strategy and the identical-offer-price strategy as the best one to the questionnaires, 15 of 20 subjects answered submitting C-6 as the best one.

which was the subgame perfect equilibrium level (see Figure 6). The mean dango effectiveness index throughout the sessions was –0.30, which was not significantly larger than –0.40.[40]

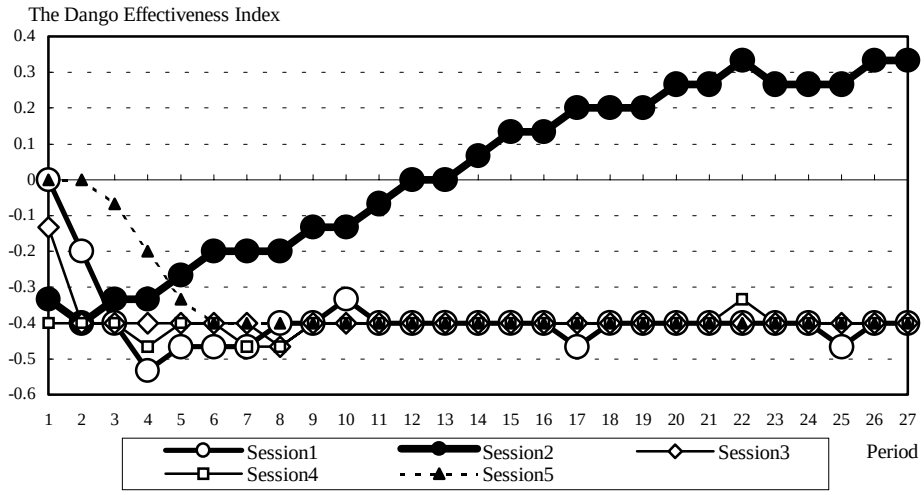

Figure 6: The dango effectiveness index in the Outsider/Cost sessions

First, let us describe subjects' behavior in sessions 1, 3, 4 and 5. In session 1, 3 subjects in the same room tried to send a price signal in order to have an outsider lift his offer price. However, the outsider did not respond to it cooperatively. In sessions 3, 4 and 5, 3 subjects did not communicate with each other throughout the sessions. In these sessions, 6 of 12 subjects wrote on the Answer Sheet that because other subjects were in the separate room, they thought that communication was useless.

[40] We examined whether the mean index (-0.30) was significantly larger than –0.40 by using the *t* test. The variance of the mean index was 0.051. Since the *t* value was 1.89, we could not reject the null hypothesis that the mean index was equal to –0.40 at the 5% significance level for one-tailed test.

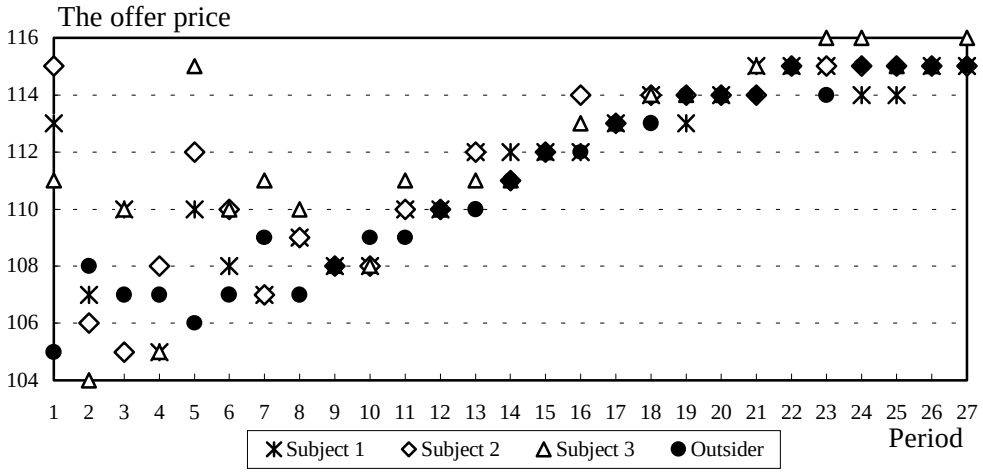

Figure 7: Successful price signaling: the offer price in session 2 of the Outsider/Cost treatment (The Unit Cost: 110, The ceiling Price: 125)

On the other hand, subjects in session 2 succeeded to make tacit collusion by price signaling (see Figure 7). The ceiling price and the unit cost were 125 and 110, respectively. The winning price gradually increased from 104 to 115. Let us describe subjects' behavior. Before period 5, 3 subjects in the same room agreed to submit more than 110 in order to observe which offer price the outsider would submit. Observing that subject 1 won at 107 in period 7, subjects 2 and 3 said, "The outsider seems to be lifting her offer price." After the outsider raised her offer price by one unit in period 9, the winning price gradually increased by one unit in every 2 or 3 periods. Before period 13, subject 1 said, "The winning price is increasing step by step. Let's keep raising our offer prices." Subjects 2 and 3 agreed to do so. The outsider positively responded to price signal and raised her offer price in the subsequent periods. On the Answer Sheet, the outsider wrote that she continued to adopt the strategy of deciding her offer price by considering an upward trend in the winning price. The 3 subjects also wrote that they intended to make the outsider raise her offer price by raising their offer prices simultaneously. These answers indicate that all subjects including the outsider had willingness to cooperate to raise the winning price.

Surprisingly, the probability of cooperation in the Outsider/Cost sessions is also 0.2, which is identical to the Outsider/No-Cost sessions. Although it is not clear whether subjects who successfully generated tacit collusion were really altruistic or not, these results are consistent with Andreoni and Miller (1993)'s observation.

We can summarize the observations as follows:

Observation 4: The mixture of the outsider and the sunk cost effects reduces an incentive of subjects to collude. As a result, price competition occurs, and the winning price decreases considerably. However, even though there is the joint effect, tacit collusion may occur if all subjects including

an outsider have willingness to cooperate and can recognize it by using price signaling.

3.5 Comparison of the mean dango effectiveness index

In this section, we compare the mean dango effectiveness indexes between treatments statistically. Figure 8 shows the patterns of the mean indexes across 27 periods for 5 sessions in each experiment. The horizontal axis corresponds to periods, and the vertical axis corresponds to the mean dango effectiveness index.

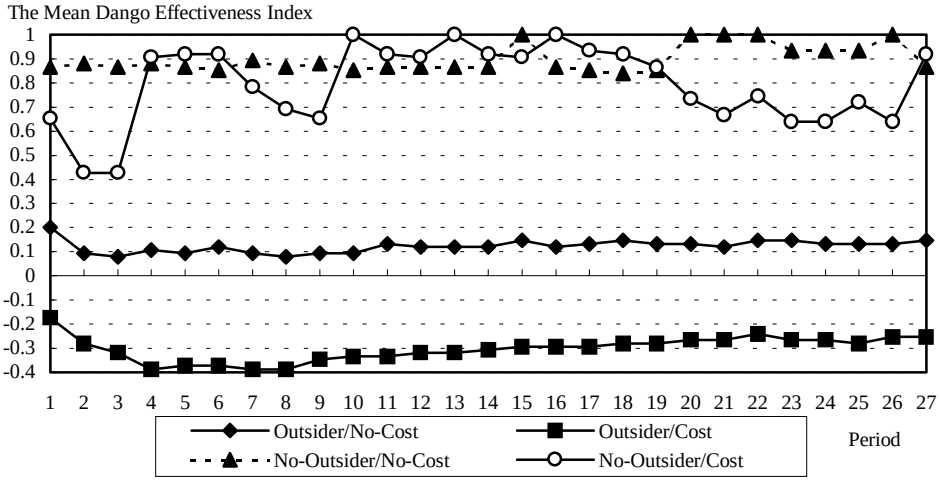

Figure 8: The mean dango effectiveness index in each treatment

In the Outsider/No-Cost sessions, the mean dango effectiveness index moves around 0.1. In the Outsider/Cost sessions, after the mean index decreases to –0.39 until period 8, it gradually increases to –0.25. In the No-Outsider/No-Cost sessions, the mean index across sessions fluctuates between 0.85 and 1.0. In the No-Outsider/Cost sessions, the mean index fluctuates between 0.6 and 1.0 after period 4. It is evident from Figure 8 that the mean indexes in the Outsider/No-Cost and the Outsider/Cost sessions are much lower than those in the No-Outsider/No-Cost and the No-Outsider/Cost sessions, respectively. The mean index in the Outsider/Cost sessions is also lower than that in the Outsider/No-Cost sessions. On the other hand, the difference between the mean indexes in the No-Outsider/Cost and No-Outsider/No-Cost sessions is not clear.

We used the randomization test to examine the significance of differences between the mean dango effectiveness indexes in these sessions.[41] From the tests and the patterns illustrated in Figure 8, we obtained the following 3 observations.

Observation 5: The mean dango effectiveness indexes in the Outsider/No-Cost and the Outsider/Cost

are significantly lower than those in the No-Outsider/No-Cost and No-Outsider/Cost sessions at 5% significance level in all periods, respectively. The outsider has an effect to make the winning price decrease considerably, regardless of the existence of the sunk cost.

Observations 6: The mean dango effectiveness index is not significantly different between in the No-Outsider/No-Cost and the No-Outsider/Cost sessions at 5% significance level in any periods. If there is no outsider, the sunk cost has no effect on the winning price.

Observation 7: The mean dango effectiveness index in the Outsider/Cost sessions is significantly lower than that in the Outsider/No-Cost sessions at 5% significance level in all periods. If there is the outsider, the sunk cost has an effect to make the winning price decrease.

4. Concluding Remarks

We conducted a series of experiments in order to obtain some insight into the effect of the Japanese new public construction works procurement system. The experiments are first attempts to examine the effect of the entry of the outsider and the sunk cost in the bidding system by using the experimental method. From the results, we found the following three conclusions. First, the outsider has a strong effect to prevent subjects from colluding and to make the winning price decrease to the subgame perfect equilibrium price. Second, if subjects including the outsider have willingness to cooperate with other subjects and if they can recognize it by using price signaling, they can form successful tacit collusion. As a result, the winning price increases gradually. Interestingly, since successful tacit collusion occurred in 2 of 10 sessions with an outsider, we obtained the same observation of Andreoni and Miller (1993) that the average probability of cooperation was about 0.2. Third, the sunk cost has an effect to strengthen subjects' incentive to defect from collusion through their expectation of a final period. However, the impact is restrictive, and the sunk cost does not make the winning price decrease.

The result of the experiments implies that a policy to help outsiders such as foreign firms to participate in the bidding may be a crucial countermeasure against bidders' dango. In the new bidding system, requirements for the eligibility for participating in the bidding were reformed in a way that foreign firms were not behind Japanese firms. The implication we obtained supports the direction of this revision for the bidding system. If outsiders actually participate in the bidding, we can expect that it is more difficult for dango members to collude and that the winning price decreases considerably under the new bidding system.

However, it is difficult to assure that the entry of foreign firms naturally have the same effect as the result of the experiments in a real situation. Note that successful tacit collusion by price signaling

[41] The details and results of the statistical analysis are shown in the Appendix.

was observed in 2 sessions with an outsider. This means that even though the outsiders participate in the bidding, the winning price does not always decrease considerably if all bidders have willingness to collude and can recognize it by using some tool such as price signaling. As McMillan (1991) suggests, many complex features of the Japanese construction industry such as a dango organizer, an inter-firm association and collusion between firms and officials are likely to have contributed to make and maintain dango. In fact, we observed that subject 1 in session 2 of the Outsider/No-Cost sessions played a role of the dango organizer and mainly contributed to make tacit collusion. In order to estimate the effect of the new bidding system more precisely, further research for identification of factors generating tacit collusion and for examination of the impacts on bidders' behavior are needed. For example, examination of an effect of the dango organizer on other subjects' behavior is considered to be one of the important research objectives.

Moreover, we should continue to isolate other factors that prevent bidders from colluding and to examine their effects by using an experimental method. One of the candidates is a penalty for collusion. The previous studies such as McMillan (1991) and Woodall (1996) point out that the light penalty for collusion in Japan is one of causes for dango. The fine of the criminal penalty against a firm amounts to a maximum of 100 million yen, which is about one-tenth of that in the United States. The actual number of legal measures per year was about 8 from 1989 to 1997, which was also much smaller than that of the United States. Although there is possibility that the penalty against collusion has some effect on bidders' collusive behavior, studies of the impact have not been reported. It is necessary to conduct the experiments designed to examine the penalty effect on bidders' behavior in the future.

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Appendix:

The tests of differences in the mean dango effectiveness index using a randomization test

We examined the significance of differences between the mean dango effectiveness indexes in the sessions using a randomization test.[42] The following 4 hypotheses were tested.

Test 1. H_0: $\mu_{Outsider/No\text{-}Cost,j} = \mu_{Outsider/Cost,j}$, H_1: $\mu_{Outsider/No\text{-}Cost,j} > \mu_{Outsider/Cost,j}$;

Test 2. H_0: $\mu_{No\text{-}Outsider/No\text{-}Cost,j} = \mu_{No\text{-}Outsider/Cost,j}$, H_1: $\mu_{No\text{-}Outsider/No\text{-}Cost,j} > \mu_{No\text{-}Outsider/Cost,j}$;

Test 3. H_0: $\mu_{No\text{-}Outsider/No\text{-}Cost,j} = \mu_{Outsider/No\text{-}Cost,j}$, H_1: $\mu_{No\text{-}Outsider/No\text{-}Cost,j} > \mu_{Outsider/No\text{-}Cost,j}$;

Test 4. H_0: $\mu_{No\text{-}Outsider/Cost,j} = \mu_{Outsider/Cost,j}$, H_1: $\mu_{No\text{-}Outsider/Cost,j} > \mu_{Outsider/Cost,j}$,

where $\mu_{i,j}$ indicates the mean dango effectiveness index in period *j* of session *i*.

The result of these tests is given in Table 3. Figures in boxes are the *p*-values.

Table 3: The result of the randomization test on the difference in the mean of 2 experiments

	Test 1	Test 2	Test 3	Test 4
1	0.01	0.40	0.02	0.01
2	0.02	0.17	0.00	0.03
3	0.01	0.28	0.01	0.05
4	0.01	1.00	0.01	0.01
5	0.01	1.00	0.01	0.01
6	0.01	1.00	0.00	0.01
7	0.00	1.00	0.01	0.00
8	0.01	0.58	0.01	0.01
9	0.01	1.00	0.01	0.02
10	0.01	1.00	0.01	0.01
11	0.01	1.00	0.01	0.01
12	0.01	1.00	0.01	0.01
13	0.02	1.00	0.01	0.01
14	0.02	1.00	0.01	0.01
15	0.03	1.00	0.01	0.01
16	0.03	1.00	0.01	0.01
17	0.04	1.00	0.01	0.01
18	0.04	1.00	0.02	0.01
19	0.04	1.00	0.02	0.01
20	0.04	0.44	0.01	0.02
21	0.04	0.17	0.01	0.01
22	0.04	1.00	0.00	0.02
23	0.08	0.44	0.00	0.05
24	0.04	0.44	0.00	0.05
25	0.04	1.00	0.00	0.04
26	0.04	0.44	0.00	0.05
27	0.04	0.44	0.01	0.01

Table 3 provides us the following 4 observations.

(1) The mean dango effectiveness index in the Outsider/No-Cost sessions is significantly larger than

[42] The details how to use the randomization test is shown in chapter 9 of Davis and Holt (1993).

that in the Outsider/Cost sessions in all sessions except period 23 at 5% significance level.

(2) No significant difference between the mean dango effectiveness indexes in the No-Outsider/No-Cost and No-Outsider/Cost sessions at 5% significance level is observed.

(3) The mean dango effectiveness index in the No-Outsider/No-Cost sessions is significantly larger than that in the Outsider/No-Cost sessions in all periods at 5% significance level.

(4) The mean dango effectiveness index in the No-Outsider/Cost sessions is significantly larger than that in the Outsider/Cost sessions in all periods at 5% significance level.

Sheets used in the Experiments and Data*

Mitsuhiro Nihashi, Tatsuyoshi Saijo and Masashi Une

* These are translated directly from the experimental materials written in Japanese.

1. Instruction Sheet

1.1 Instruction Sheet for the Outsider/No-Cost sessions

1.1.1 Ror 3 subjects

Abstract

In this experiment, we assume that you produce one unit of good in each period. If you can sell one unit to the experimenters at your offer price, you get an amount of the offer price minus a production cost as a profit. However, because there are some other subjects who can sell the same good, your offer price has to be satisfied with the following two conditions in order to sell to the experimenters. The first is that your offer price is equal to or lower than a price the experimenters determined prior to the experiment. The second is that your offer price is the lowest one in all offer prices. Your payoff is determined by a sum of your profits, and the experimenters will pay it to you at the end of the experiment. We will explain how to determine your payoff afterward.

During the experiments, you can talk with other subjects if the experimenters permit it. Otherwise, don't talk anything. Please follow the experimenters' direction.

Explanation

Please confirm the following six sheets of papers on your desk.

・Abstract and Experiments (This sheet) ・Personal Card ・Name Plate
・Record Sheet ・Box ・Report Sheet (a bundle of paper) ・Experimental Procedure

First, please write your name, belongings, sex and age on your Personal Card. You will fill in your receipt after the experiment.

Your "ID Number" and "Your Cost" is written on your Name Plate. Your Cost is a cost that you must spend on producing one unit of the good.

Record Sheet is used for the record of Your Cost and your profit. Please write Your Cost on your Record Sheet. Put your Name Plate on near your neck in such a way that other subjects can see it well.

Report Sheet is used to inform the experimenters of your offer price. Please use one piece of paper in each period. When you finish writing your offer price on your Report Sheet, please put it into your Box.

Experimental Procedure summarizes the procedure of the experiment. Please refer it if necessary.

Let us now explain about the detailed procedure of this experiment. The experiment will continue until the experimenters say, "The experiment has ended." The number of periods has been already determined. But, the experimenters don't inform you of it. When each period starts, write your offer price on your Record Sheet in such a way that other subjects cannot see it. Your offer price you can write is limited in a range the experimenters will assign. If your offer price is smaller than a minimum price of the range, it will be assumed as the minimum price. If it is higher than a maximum price of the range, it will be assumed as the maximum price. Finishing writing your offer price on your Record Sheet, put it into your Box. The experimenters collect it and determine which subject they will buy one unit of the good from in the following manner. The experimenters have already determined "The Highest Price." The Highest Price is the maximum price at which the experimenters want to buy one unit of the good. The experimenters remove offer prices that are higher than The Highest Price. Offer prices equal to The Highest Price are not removed. The experimenters find the lowest offer price in all prices not removed and buy one unit of the good from a subject who submitted it at the offer price. When all offer prices are higher than The Highest Price, the experimenters don't buy the good in the period. The Highest Price will be informed you before the experiment starts by the backboard. The Highest Price is fixed throughout the experiment.

In order to understand the procedure described above, let us show a simple example. It is assumed that 3 subjects, A, B and C submit 130, 140 and 150, respectively. The Highest Price is assumed to be 145. First, the experimenters remove subject C's offer price because 150 is higher than The Highest Price. In the other offer prices, subject A's offer price is the lowest price. So, subject A will sell one unit of the good at 130 to the experimenters.

When the experimenters buy the good, they say, "We will buy one unit of the good at (the lowest offer price) from (ID Number)." In addition, they write the lowest offer price and the subject's ID Number on the blackboard. Please raise your hand if your ID Number is announced. If all offer prices are higher than The Highest Price, the experimenters say, "We cannot buy the good." If multiple subjects submit the lowest offer price, the experimenters tell them to throw a die. If your ID Number is announced, throw a die. The experimenters buy the good from a subject whose number of a die is the highest. This is the end of one period.

Before each period, you can talk with other two subjects. You can talk about anything. But, you are not allowed a physical threat. While a maximum time of talking is 5 minutes before periods 1, it is 3 minutes before the other periods. After the experimenters say, "You can talk with other subjects," you can start talking. If the talking time finished, the experimenters say, "Stop talking." As soon as you determine your offer price, you write the offer price on your Report Sheet and put it into your Box. Don't talk without the experimenters' direction. In the experiments, there are some subjects in the other room. They also want to sell the good to the experimenters. The experimenters don't inform you of the number of the subjects. Therefore, the experimenters compare offer prices subjects not only in this room but also in the other room submitted. Your Cost is the same in all subjects.

Next, let us explain how to fill in your Record Sheet. You compute your profit in the period as follows and fill the number in the column of "Your Profit."

(1) If the experimenters announced that they would buy the good from you, your profit is the number of your offer price minus Your Cost. Note that if your offer price is smaller than Your Cost, your profit is negative.
(2) Otherwise, your profit is zero.

For example, we assume that each subject's Your Cost is 120 in the previous example. Subjects B and C write zero in the column of Your Profit because the experimenters don't announce their ID Number. On the other hand, because the experimenters announce subject A's ID Number, subject A writes 10 (=130-120) in the column of Your Profit.

Finally, we explain your payoff. Your payoff depends on the sum of your profits and is computed as follows:

$$1300 + 10 \times (\text{the sum of your profits}).$$

If the sum of your profits is 110, your payoff is 2400 ($=1300 + 10 \times 110$).

When the experimenters say, "The experiment has ended," follow their direction.

Before the actual experiment, you will do the three period practices. Please determine your offer price without talking with other subjects only in the practice periods. Your profit in the practice periods is not counted in your payoff. The time of considering your offer price is 3 minutes. As soon as you determine your offer price, write it on your Report Sheet and put it into your Box.

This is the end of the instruction. If you have any questions, please ask them to the experimenters.

1.1.2 For an outsider

Abstract

In this experiment, we assume that you produce one unit of good in each period. If you can sell one unit to the experimenters at your offer price, you get an amount of the offer price minus a production cost as a profit. However, because there are some other subjects who can sell the same good, your offer price has to be satisfied with the following two conditions in order to sell to the experimenters. The first is that your offer price is equal to or lower than a price the experimenters determined prior to the experiment. The second is that your offer price is the lowest one in all offer prices. Your payoff is determined by a sum of your profits, and the experimenters will pay it to you at the end of the experiment. We will explain how to determine your payoff afterward.

During the experiments, don't talk anything. Please follow the experimenters' direction.

Explanation

Please confirm the following six sheets of papers on your desk.

・Abstract and Experiments (This sheet) ・Personal Card ・Name Plate
・Record Sheet ・Box ・Report Sheet (a bundle of paper) ・Experimental Procedure

First, please write your name, belongings, sex and age on your Personal Card. You will fill in your receipt after the experiment.

Your "ID Number" and "Your Cost" is written on your Name Plate. Your Cost is a cost that you must spend on producing one unit of the good.

Record Sheet is used for the record of Your Cost and your profit. Please write Your Cost on your Record Sheet. Put your Name Plate on near your neck.

Report Sheet is used to inform the experimenters of your offer price. Please use one piece of paper in each period. When you finish writing your offer price on your Report Sheet, please put it into your Box.

Experimental Procedure summarizes the procedure of the experiment. Please refer it if necessary.

Let us now explain about the detailed procedure of this experiment. The experiment will continue until the experimenters say, "The experiment has ended." The number of periods has been already determined. But, the experimenters don't inform you of it. When each period starts, write your offer price on your Record Sheet. Your offer price you can write is limited in a range the experimenters will assign. If your offer price is smaller than a minimum price of the range, it will be assumed as the minimum price. If it is higher than a maximum price of the range, it will be assumed as the maximum price. Finishing writing your offer price on your Record Sheet, put it into your Box. The experimenters collect it and determine which subject they will buy one unit of the good from in the following manner. The experimenters have already determined "The Highest Price." The Highest Price is the maximum price at which the experimenters want to buy one unit of the good. The experimenters remove offer prices that are higher than The Highest Price. Offer prices equal to The Highest Price are not removed. The experimenters find the lowest offer price in all prices not removed and buy one unit of the good from a subject who submitted it at the offer price. When all offer prices are higher than The Highest Price, the experimenters don't buy the good in the period. The Highest Price will be informed you before the experiment starts by the backboard. The Highest Price is fixed throughout the experiment.

In order to understand the procedure described above, let us show a simple example. It is assumed that 3 subjects, A, B and C submit 130, 140 and 150, respectively. The Highest Price is assumed to be 145. First, the experimenters remove subject C's offer price because 150 is higher than The Highest Price. In the other offer prices, subject A's offer price is the lowest price. So, subject A will sell one unit of the good at 130 to the experimenters.

When the experimenters buy the good, they say, “We will buy one unit of the good at (the lowest offer price) from (ID Number).” In addition, they write the lowest offer price and the subject’s ID Number on the blackboard. If all offer prices are higher than The Highest Price, the experimenters say, “We cannot buy the good.” If multiple subjects submit the lowest offer price, the experimenters tell them to throw a die. If your ID Number is announced, throw a die. The experimenters buy the good from a subject whose number of a die is the highest. This is the end of one period.

Before each period, you can consider your offer price in several minutes. While a maximum time of consideration is 5 minutes before periods 1, it is 3 minutes before the other periods. If the time finished, the experimenters say, “Write your offer price on your Report Sheet and put it into your Box.” As soon as you determine your offer price, you can submit your offer price. Don’t talk without asking a question. In the experiments, there are some subjects in the other room. They also want to sell the good to the experimenters. The experimenters don’t inform you of the number of the subjects. Therefore, the experimenters compare offer prices subjects not only in this room but also in the other room submitted. Your Cost is the same in all subjects.

Next, let us explain how to fill in your Record Sheet. You compute your profit in the period as follows and fill the number in the column of “Your Profit.”

(1) If the experimenters announced that they would buy the good from you, your profit is the number of your offer price minus Your Cost. Note that if your offer price is smaller than Your Cost, your profit is negative.
(2) Otherwise, your profit is zero.

For example, we assume that each subject’s Your Cost is 120 in the previous example. Subjects B and C write zero in the column of Your Profit because the experimenters don’t announce their ID Number. On the other hand, because the experimenters announce subject A’s ID Number, subject A writes 10 (=130-120) in the column of Your Profit.

Finally, we explain your payoff. Your payoff depends on the sum of your profits and is computed as follows:

$$1300 + 10 \times (\text{the sum of your profits}).$$

If the sum of your profits is 110, your payoff is 2400 ($=1300 + 10 \times 110$).

When the experimenters say, “The experiment has ended,” follow their direction.

Before the actual experiment, you will do the three period practices. Your profit in the practice periods is not counted in your payoff. The time of considering your offer price is 3 minutes. As soon as you determine your offer price, write it on your Report Sheet and put it into your Box.

This is the end of the instruction. If you have any questions, please ask them to the experimenters.

1.2 Instruction Sheet for the Outsider/Cost sessions

1.2.1 For 3 subjects

Abstract

In this experiment, we assume that you produce one unit of good in each period. If you can sell one unit to the experimenters at your offer price, you get an amount of the offer price minus a production cost as a profit. However, If you cannot sell the good to the experimenters, you have to pay 7 units as a trading cost to the experimenters. In order to sell to the experimenters, because there are some other subjects who can sell the same good, your offer price has to be satisfied with the following two conditions. The first is that your offer price is equal to or lower than a price the experimenters determined prior to the experiment. The second is that your offer price is the lowest one in all offer prices. Your payoff is determined by a sum of your profits, and the experimenters will pay it to you at the end of the experiment. We will explain how to determine your payoff afterward.

During the experiments, you can talk with other subjects if the experimenters permit it. Otherwise, don't talk anything. Please follow the experimenters' direction.

Explanation

Please confirm the following six sheets of papers on your desk.

・Abstract and Experiments (This sheet) ・Personal Card ・Name Plate
・Record Sheet ・Box ・Report Sheet (a bundle of paper) ・Experimental Procedure

First, please write your name, belongings, sex and age on your Personal Card. You will fill in your receipt after the experiment.

Your "ID Number" and "Your Cost" is written on your Name Plate. Your Cost is a cost that you must spend on producing one unit of the good.

Record Sheet is used for the record of Your Cost and your profit. Please write Your Cost on your Record Sheet. Put your Name Plate on near your neck in such a way that other subjects can see it well.

Report Sheet is used to inform the experimenters of your offer price. Please use one piece of paper in each period. When you finish writing your offer price on your Report Sheet, please put it into your Box.

Experimental Procedure summarizes the procedure of the experiment. Please refer it if necessary.

Let us now explain about the detailed procedure of this experiment. The experiment will continue until the experimenters say, "The experiment has ended." The number of periods has been already determined. But, the experimenters don't inform you of it. When each period starts, write your offer price on your Record Sheet in such a way that other subjects cannot see it. Your offer price you can write is limited in a range the experimenters will assign. If your offer price is smaller than a minimum price of the range, it will be assumed as the minimum price. If it is higher than a maximum price of the range, it will be assumed as the maximum price. Finishing writing your offer price on your Record Sheet, put it into your Box. The experimenters collect it and determine which subject they will buy one unit of the good from in the following manner. The experimenters have already determined "The Highest Price." The Highest Price is the maximum price at which the experimenters want to buy one unit of the good. The experimenters remove offer prices that are higher than The Highest Price. Offer prices equal to The Highest Price are not removed. The experimenters find the lowest offer price in all prices not removed and buy one unit of the good from a subject who submitted it at the offer price. When all offer prices are higher than The Highest Price, the experimenters don't buy the good in the period. The Highest Price will be informed you before the experiment starts by the backboard. The Highest Price is fixed throughout the experiment. If your cannot sell the good to the experimenters, you have to pay 7 units as a trading cost.

In order to understand the procedure described above, let us show a simple example. It is assumed that 3 subjects, A, B and C submit 130, 140 and 150, respectively. The Highest Price is assumed to be 145. First, the experimenters remove subject C's offer price because 150 is higher than The Highest Price. In the other offer prices, subject A's offer price is the lowest price. So, subject A will sell one unit of the good at 130 to the experimenters. Because subjects B and C cannot sell the good, pay 7 units as a trading cost to the experimenters. Their profits in the period are –7.

When the experimenters buy the good, they say, "We will buy one unit of the good at (the lowest offer price) from (ID Number)." In addition, they write the lowest offer price and the subject's ID Number on the blackboard. Please raise your hand if your ID Number is announced. If all offer prices are higher than The Highest Price, the experimenters say, "We cannot buy the good." If multiple subjects submit the lowest offer price, the experimenters tell them to throw a die. If your ID Number is announced, throw a die. The experimenters buy the good from a subject whose number of a die is the highest. This is the end of one period.

Before each period, you can talk with other two subjects. You can talk about anything. But, you are not allowed a physical threat. While a maximum time of talking is 5 minutes before periods 1, it is 3 minutes before the other periods. After the experimenters say, "You can talk with other subjects," you can start talking. If the talking time finished, the experimenters say, "Stop talking." As soon as you determine your offer price, you write the offer price on your Report Sheet and put it into your Box. Don't talk without the experimenters' direction. In the experiments, there are some subjects in the other room. They also want to sell the good to the experimenters. The experimenters don't inform you of the number of the subjects. Therefore, the experimenters compare offer prices subjects not only in this room but also in the other room submitted. Your Cost is the same in all subjects.

Next, let us explain how to fill in your Record Sheet. You compute your profit in the period as follows and fill the number in the column of "Your Profit."

(1) If the experimenters announced that they would buy the good from you, your profit is the number of your offer price minus Your Cost. Note that if your offer price is smaller than Your Cost, your profit is negative.
(2) Otherwise, your profit is –7.

For example, we assume that each subject's Your Cost is 120 in the previous example. Subjects B and C write –7 in the column of Your Profit because the experimenters don't announce their ID Number. On the other hand, because the experimenters announce subject A's ID Number, subject A writes 10 (=130-120) in the column of Your Profit.

Finally, we explain your payoff. Your payoff depends on the sum of your profits and is computed as follows:

$$3300 + 10 \times (\text{the sum of your profits}).$$

If the sum of your profits is 20, your payoff is 3500 ($=3300 + 10 \times 20$).

When the experimenters say, "The experiment has ended," follow their direction.

Before the actual experiment, you will do the three period practices. Please determine your offer price without talking with other subjects only in the practice periods. Your profit in the practice periods is not counted in your payoff. The time of considering your offer price is 3 minutes. As soon as you determine your offer price, write it on your Report Sheet and put it into your Box.

This is the end of the instruction. If you have any questions, please ask them to the experimenters.

1.2.2 For an outsider

Abstract

In this experiment, we assume that you produce one unit of good in each period. If you can sell one unit to the experimenters at your offer price, you get an amount of the offer price minus a production cost as a profit. However, If you cannot sell the good to the experimenters, you have to pay 7 units as a trading cost to the experimenters. In order to sell to the experimenters, because there are some other subjects who can sell the same good, your offer price has to be satisfied with the following two conditions. The first is that your offer price is equal to or lower than a price the experimenters determined prior to the experiment. The second is that your offer price is the lowest one in all offer prices. Your payoff is determined by a sum of your profits, and the experimenters will pay it to you at the end of the experiment. We will explain how to determine your payoff afterward.

During the experiments, don't talk anything. Please follow the experimenters' direction.

Explanation

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Record Sheet is used for the record of Your Cost and your profit. Please write Your Cost on your Record Sheet. Put your Name Plate on near your neck.

Report Sheet is used to inform the experimenters of your offer price. Please use one piece of paper in each period. When you finish writing your offer price on your Report Sheet, please put it into your Box.

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Let us now explain about the detailed procedure of this experiment. The experiment will continue until the experimenters say, "The experiment has ended." The number of periods has been already determined. But, the experimenters don't inform you of it. When each period starts, write your offer price on your Record Sheet. Your offer price you can write is limited in a range the experimenters will assign. If your offer price is smaller than a minimum price of the range, it will be assumed as the minimum price. If it is higher than a maximum price of the range, it will be assumed as the maximum price. Finishing writing your offer price on your Record Sheet, put it into your Box. The experimenters collect it and determine which subject they will buy one unit of the good from in the following manner. The experimenters have already determined "The Highest Price." The Highest Price is the maximum price at which the experimenters want to buy one unit of the good. The experimenters remove offer prices that are higher than The Highest Price. Offer prices equal to The Highest Price are not removed. The experimenters find the lowest offer price in all prices not removed and buy one unit of the good from a subject who submitted it at the offer price. When all offer prices are higher than The Highest Price, the experimenters don't buy the good in the period. The Highest Price will be informed you before the experiment starts by the backboard. The Highest Price is fixed throughout the experiment. If your cannot sell the good to the experimenters, you have to pay 7 units as a trading cost.

In order to understand the procedure described above, let us show a simple example. It is assumed that 3 subjects, A, B and C submit 130, 140 and 150, respectively. The Highest Price is assumed to be 145. First, the experimenters remove subject C's offer price because 150 is higher than The

Highest Price. In the other offer prices, subject A's offer price is the lowest price. So, subject A will sell one unit of the good at 130 to the experimenters. Because subjects B and C cannot sell the good, pay 7 units as a trading cost to the experimenters. Their profits in the period are –7.

When the experimenters buy the good, they say, "We will buy one unit of the good at (the lowest offer price) from (ID Number)." In addition, they write the lowest offer price and the subject's ID Number on the blackboard. If all offer prices are higher than The Highest Price, the experimenters say, "We cannot buy the good." If multiple subjects submit the lowest offer price, the experimenters tell them to throw a die. If your ID Number is announced, throw a die. The experimenters buy the good from a subject whose number of a die is the highest. This is the end of one period.

Before each period, you can consider your offer price in several minutes. While a maximum time of consideration is 5 minutes before periods 1, it is 3 minutes before the other periods. If the time finished, the experimenters say, "Write your offer price on your Report Sheet and put it into your Box." As soon as you determine your offer price, you can submit your offer price. Don't talk without asking a question. In the experiments, there are some subjects in the other room. They also want to sell the good to the experimenters. The experimenters don't inform you of the number of the subjects. Therefore, the experimenters compare offer prices subjects not only in this room but also in the other room submitted. Your Cost is the same in all subjects.

Next, let us explain how to fill in your Record Sheet. You compute your profit in the period as follows and fill the number in the column of "Your Profit."

(1) If the experimenters announced that they would buy the good from you, your profit is the number of your offer price minus Your Cost. Note that if your offer price is smaller than Your Cost, your profit is negative.
(2) Otherwise, your profit is –7.

For example, we assume that each subject's Your Cost is 120 in the previous example. Subjects B and C write –7 in the column of Your Profit because the experimenters don't announce their ID Number. On the other hand, because the experimenters announce subject A's ID Number, subject A writes 10 (=130-120) in the column of Your Profit.

Finally, we explain your payoff. Your payoff depends on the sum of your profits and is computed as follows:

$$3300 + 10 \times (\text{the sum of your profits}).$$

If the sum of your profits is 20, your payoff is 3500 ($=3300 + 10 \times 20$).

When the experimenters say, "The experiment has ended," follow their direction.

Before the actual experiment, you will do the three period practices. Your profit in the practice periods is not counted in your payoff. The time of considering your offer price is 3 minutes. As soon as you determine your offer price, write it on your Report Sheet and put it into your Box.

This is the end of the instruction. If you have any questions, please ask them to the experimenters.

1.3 Instruction Sheet for the No-Outsider/No-Cost sessions

Abstract

In this experiment, we assume that you produce one unit of good in each period. If you can sell one unit to the experimenters at your offer price, you get an amount of the offer price minus a production cost as a profit. However, because there are some other subjects who can sell the same good, your offer price has to be satisfied with the following two conditions in order to sell to the experimenters. The first is that your offer price is equal to or lower than a price the experimenters determined prior to the experiment. The second is that your offer price is the lowest one in all offer prices. Your payoff is determined by a sum of your profits, and the experimenters will pay it to you at the end of the experiment. We will explain how to determine your payoff afterward.

During the experiments, you can talk with other subjects if the experimenters permit it. Otherwise, don't talk anything. Please follow the experimenters' direction.

Explanation

Please confirm the following six sheets of papers on your desk.

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Your "ID Number" and "Your Cost" is written on your Name Plate. Your Cost is a cost that you must spend on producing one unit of the good.

Record Sheet is used for the record of Your Cost and your profit. Please write Your Cost on your Record Sheet. Put your Name Plate on near your neck in such a way that other subjects can see it well.

Report Sheet is used to inform the experimenters of your offer price. Please use one piece of paper in each period. When you finish writing your offer price on your Report Sheet, please put it into your Box.

Experimental Procedure summarizes the procedure of the experiment. Please refer it if necessary.

Let us now explain about the detailed procedure of this experiment. The experiment will continue until the experimenters say, "The experiment has ended." The number of periods has been already determined. But, the experimenters don't inform you of it. When each period starts, write your offer price on your Record Sheet in such a way that other subjects cannot see it. Your offer price you can write is limited in a range the experimenters will assign. If your offer price is smaller than a minimum price of the range, it will be assumed as the minimum price. If it is higher than a maximum price of the range, it will be assumed as the maximum price. Finishing writing your offer price on your Record Sheet, put it into your Box. The experimenters collect it and determine which subject they will buy one unit of the good from in the following manner. The experimenters have already determined "The Highest Price." The Highest Price is the maximum price at which the experimenters want to buy one unit of the good. The experimenters remove offer prices that are higher than The Highest Price. Offer prices equal to The Highest Price are not removed. The experimenters find the lowest offer price in all prices not removed and buy one unit of the good from a subject who submitted it at the offer price. When all offer prices are higher than The Highest Price, the experimenters don't buy the good in the period. The Highest Price will be informed you before the experiment starts by the backboard. The Highest Price is fixed throughout the experiment.

In order to understand the procedure described above, let us show a simple example. It is assumed that 3 subjects, A, B and C submit 130, 140 and 150, respectively. The Highest Price is assumed to be 145. First, the experimenters remove subject C's offer price because 150 is higher than The Highest Price. In the other offer prices, subject A's offer price is the lowest price. So, subject A will

sell one unit of the good at 130 to the experimenters.

When the experimenters buy the good, they say, “We will buy one unit of the good at (the lowest offer price) from (ID Number).” In addition, they write the lowest offer price and the subject’s ID Number on the blackboard. If all offer prices are higher than The Highest Price, the experimenters say, “We cannot buy the good.” If multiple subjects submit the lowest offer price, the experimenters tell them to throw a die. If your ID Number is announced, throw a die. The experimenters buy the good from a subject whose number of a die is the highest. This is the end of one period.

Before each period, you can talk with other two subjects. You can talk about anything. But, you are not allowed a physical threat. While a maximum time of talking is 5 minutes before periods 1, it is 3 minutes before the other periods. After the experimenters say, “You can talk with other subjects,” you can start talking. If the talking time finished, the experimenters say, “Stop talking.” As soon as you determine your offer price, you write the offer price on your Report Sheet and put it into your Box. Don’t talk without the experimenters’ direction.

Next, let us explain how to fill in your Record Sheet. You compute your profit in the period as follows and fill the number in the column of “Your Profit.”

(1) If the experimenters announced that they would buy the good from you, your profit is the number of your offer price minus Your Cost. Note that if your offer price is smaller than Your Cost, your profit is negative.
(2) Otherwise, your profit is zero.

For example, we assume that each subject’s Your Cost is 120 in the previous example. Subjects B and C write zero in the column of Your Profit because the experimenters don’t announce their ID Number. On the other hand, because the experimenters announce subject A’s ID Number, subject A writes 10 (=130-120) in the column of Your Profit.

Finally, we explain your payoff. Your payoff depends on the sum of your profits and is computed as follows:

$$1300 + 10 \times (\text{the sum of your profits}).$$

If the sum of your profits is 110, your payoff is 2400 ($=1300 + 10 \times 110$).

When the experimenters say, “The experiment has ended,” follow their direction.

Before the actual experiment, you will do the three period practices. Please determine your offer price without talking with other subjects only in the practice periods. Your profit in the practice periods is not counted in your payoff. The time of considering your offer price is 3 minutes. As soon as you determine your offer price, write it on your Report Sheet and put it into your Box.

This is the end of the instruction. If you have any questions, please ask them to the experimenters.

1.4 Instruction Sheet for the No-Outsider/Cost sessions

Abstract

In this experiment, we assume that you produce one unit of good in each period. If you can sell one unit to the experimenters at your offer price, you get an amount of the offer price minus a production cost as a profit. However, If you cannot sell the good to the experimenters, you have to pay 7 units as a trading cost to the experimenters. In order to sell to the experimenters, because there are some other subjects who can sell the same good, your offer price has to be satisfied with the following two conditions. The first is that your offer price is equal to or lower than a price the experimenters determined prior to the experiment. The second is that your offer price is the lowest one in all offer prices. Your payoff is determined by a sum of your profits, and the experimenters will pay it to you at the end of the experiment. We will explain how to determine your payoff afterward.

During the experiments, you can talk with other subjects if the experimenters permit it. Otherwise, don't talk anything. Please follow the experimenters' direction.

Explanation

Please confirm the following six sheets of papers on your desk.

・Abstract and Experiments (This sheet) ・Personal Card ・Name Plate
・Record Sheet ・Box ・Report Sheet (a bundle of paper) ・Experimental Procedure

First, please write your name, belongings, sex and age on your Personal Card. You will fill in your receipt after the experiment.

Your "ID Number" and "Your Cost" is written on your Name Plate. Your Cost is a cost that you must spend on producing one unit of the good.

Record Sheet is used for the record of Your Cost and your profit. Please write Your Cost on your Record Sheet. Put your Name Plate on near your neck in such a way that other subjects can see it well.

Report Sheet is used to inform the experimenters of your offer price. Please use one piece of paper in each period. When you finish writing your offer price on your Report Sheet, please put it into your Box.

Experimental Procedure summarizes the procedure of the experiment. Please refer it if necessary.

Let us now explain about the detailed procedure of this experiment. The experiment will continue until the experimenters say, "The experiment has ended." The number of periods has been already determined. But, the experimenters don't inform you of it. When each period starts, write your offer price on your Record Sheet in such a way that other subjects cannot see it. Your offer price you can write is limited in a range the experimenters will assign. If your offer price is smaller than a minimum price of the range, it will be assumed as the minimum price. If it is higher than a maximum price of the range, it will be assumed as the maximum price. Finishing writing your offer price on your Record Sheet, put it into your Box. The experimenters collect it and determine which subject they will buy one unit of the good from in the following manner. The experimenters have already determined "The Highest Price." The Highest Price is the maximum price at which the experimenters want to buy one unit of the good. The experimenters remove offer prices that are higher than The Highest Price. Offer prices equal to The Highest Price are not removed. The experimenters find the lowest offer price in all prices not removed and buy one unit of the good from a subject who submitted it at the offer price. When all offer prices are higher than The Highest Price, the experimenters don't buy the good in the period. The Highest Price will be informed you before the experiment starts by the backboard. The Highest Price is fixed throughout the experiment. If your cannot sell the good to the experimenters, you have to pay 7 units as a trading cost.

In order to understand the procedure described above, let us show a simple example. It is assumed that 3 subjects, A, B and C submit 130, 140 and 150, respectively. The Highest Price is assumed to be 145. First, the experimenters remove subject C's offer price because 150 is higher than The Highest Price. In the other offer prices, subject A's offer price is the lowest price. So, subject A will sell one unit of the good at 130 to the experimenters. Because subjects B and C cannot sell the good, pay 7 units as a trading cost to the experimenters. Their profits in the period are –7.

When the experimenters buy the good, they say, "We will buy one unit of the good at (the lowest offer price) from (ID Number)." In addition, they write the lowest offer price and the subject's ID Number on the blackboard. If all offer prices are higher than The Highest Price, the experimenters say, "We cannot buy the good." If multiple subjects submit the lowest offer price, the experimenters tell them to throw a die. If your ID Number is announced, throw a die. The experimenters buy the good from a subject whose number of a die is the highest. This is the end of one period.

Before each period, you can talk with other two subjects. You can talk about anything. But, you are not allowed a physical threat. While a maximum time of talking is 5 minutes before periods 1, it is 3 minutes before the other periods. After the experimenters say, "You can talk with other subjects," you can start talking. If the talking time finished, the experimenters say, "Stop talking." As soon as you determine your offer price, you write the offer price on your Report Sheet and put it into your Box. Don't talk without the experimenters' direction.

Next, let us explain how to fill in your Record Sheet. You compute your profit in the period as follows and fill the number in the column of "Your Profit."

(1) If the experimenters announced that they would buy the good from you, your profit is the number of your offer price minus Your Cost. Note that if your offer price is smaller than Your Cost, your profit is negative.
(2) Otherwise, your profit is –7.

For example, we assume that each subject's Your Cost is 120 in the previous example. Subjects B and C write –7 in the column of Your Profit because the experimenters don't announce their ID Number. On the other hand, because the experimenters announce subject A's ID Number, subject A writes 10 (=130-120) in the column of Your Profit.

Finally, we explain your payoff. Your payoff depends on the sum of your profits and is computed as follows:

$$3300 + 10 \times (\text{the sum of your profits}).$$

If the sum of your profits is 20, your payoff is 3500 ($=3300 + 10 \times 20$).

When the experimenters say, "The experiment has ended," follow their direction.

Before the actual experiment, you will do the three period practices. Please determine your offer price without talking with other subjects only in the practice periods. Your profit in the practice periods is not counted in your payoff. The time of considering your offer price is 3 minutes. As soon as you determine your offer price, write it on your Report Sheet and put it into your Box.

This is the end of the instruction. If you have any questions, please ask them to the experimenters.

2 Experimental Procedure

2.1 For those who are not outsiders

The instruction of the experiment by a tape recorder (The experimenters control a tape recorder.)
↓
Time for questions
↓
Practice
1) The experimenters say, “Please start the first period of practice.”
2) When you determine your offer price, you write it on your Report Sheet and put it into your Box in such a way that other subjects cannot your offer price. (If the time finishes, the experimenters say, “Write your offer price on your Report Sheet and put it into your Box.”)
3) The experimenters collect your Report Sheet and determine a subject who can sell the good. They say, “We will buy one unit of the good at (the lowest offer price) from (ID Number).” If your ID Number is announced, raise your hand.
4) You compute your profit and write it on your Record Sheet.
* Practice consists of three periods.
↓
Time for questions
↓
Actual experiment
1) An experimenter says, “You can talk with other subjects.”
2) You can talk with other subjects in 5 minutes. (If the time finishes, the experimenters say, “Write your offer price on your Report Sheet and put it into your Box.”)
3) When you determine your offer price, you write it on your Report Sheet and put it into your Box in such a way that other subjects cannot your offer price.
4) The experimenters collect your Report Sheet and determine a subject who can sell the good. They say, “We will buy one unit of the good at (the lowest offer price) from (ID Number).” If your ID Number is announced, raise your hand.
5) You compute your profit and write it on your Record Sheet.
* The periods are repeated until the experimenters say, “The experiment has ended.” In period 2 and the subsequent periods, the time of talking is 3 minutes.
↓
After the experiment
1) You hand in your Record Sheet to the experimenters and write your address and name on your Receipt. When the experimenters give you an Answer Sheet, you fill it in.
2) Because the experimenters pay one subject’s payoff in one time, you wait until your ID Number is called.
3) When your ID Number is called, you go to the experimenters with your Personal Card and Answer Sheet.
4) You write the amount of your payoff on your Receipt and sign on it. You receive your payoff.

2.2 For outsiders

The instruction of the experiment by a tape recorder (The experimenters control a tape recorder.)
↓
Time for questions
↓
Practice
1) The experimenters say, “Please start the first period of practice.”
2) When you determine your offer price, you write it on your Report Sheet and put it into your Box in such a way that other subjects cannot your offer price. (If the time finishes, the experimenters say, “Write your offer price on your Report Sheet and put it into your Box.”)
3) The experimenters collect your Report Sheet and determine a subject who can sell the good. They say, “We will buy one unit of the good at (the lowest offer price) from (ID Number).”
4) You compute your profit and write it on your Record Sheet.
* Practice consists of three periods.
↓
Time for questions
↓
Actual experiment
1) An experimenter says, “Consider your offer price.”
2) You can consider it in 5 minutes. (If the time finishes, the experimenters say, “Write your offer price on your Report Sheet and put it into your Box.”)
3) When you determine your offer price, you write it on your Report Sheet and put it into your Box.
4) The experimenters collect your Report Sheet and determine a subject who can sell the good. They say, “We will buy one unit of the good at (the lowest offer price) from (ID Number).”
5) You compute your profit and write it on your Record Sheet.
* The periods are repeated until the experimenters say, “The experiment has ended.” In period 2 and the subsequent periods, the time of talking is 3 minutes.
↓
After the experiment
3) You hand in your Record Sheet to the experimenters and write your address and name on your Receipt. When the experimenters give you an Answer Sheet, you fill it in.
4) Because the experimenters pay one subject’s payoff in one time, you wait until your ID Number is called.
5) When your ID Number is called, you go to the experimenters with your Personal Card and Answer Sheet.
6) You write the amount of your payoff on your Receipt and sign on it. You receive your payoff.

3. Record Sheet

3.1 For the Outsider/No-Cost sessions

Record Sheet

ID Number	
Your Cost	

For Practice

	Your Profit
Period 1	
Period 2	
Period 3	

For Actual Experiment

	Your Profit			Your Profit
Period 1			Period 16	
Period 2			Period 17	
Period 3			Period 18	
Period 4			Period 19	
Period 5			Period 20	
Period 6			Period 21	
Period 7			Period 22	
Period 8			Period 23	
Period 9			Period 24	
Period 10			Period 25	
Period 11			Period 26	
Period 12			Period 27	
Period 13			Period 28	
Period 14			Period 29	
Period 15			Period 30	
		Don't fill →	The sum of Your Profits	

Don't fill the following.

$1300 + 10 \times$ [ ] = [ ] yen

(The sum of Your Profits)

3.2 For the Outsider/Cost sessions

Record Sheet

ID Number	
Your Cost	

Note: The trading cost is –7.

For Practice

	Your Profit
Period 1	
Period 2	
Period 3	

For Actual Experiment

	Your Profit			Your Profit
Period 1			Period 16	
Period 2			Period 17	
Period 3			Period 18	
Period 4			Period 19	
Period 5			Period 20	
Period 6			Period 21	
Period 7			Period 22	
Period 8			Period 23	
Period 9			Period 24	
Period 10			Period 25	
Period 11			Period 26	
Period 12			Period 27	
Period 13			Period 28	
Period 14			Period 29	
Period 15			Period 30	
		Don't fill →	The sum of Your Profits	

Don't fill the following.

$3300 + 10 \times$ [ ] = [ ] yen

(The sum of Your Profits)

3.3 For the No-Outsider/No-Cost sessions

Record Sheet

ID Number	
Your Cost	

For Practice

	Your Profit
Period 1	
Period 2	
Period 3	

For Actual Experiment

	Your Profit
Period 1	
Period 2	
Period 3	
Period 4	
Period 5	
Period 6	
Period 7	
Period 8	
Period 9	
Period 10	
Period 11	
Period 12	
Period 13	
Period 14	
Period 15	

	Your Profit
Period 16	
Period 17	
Period 18	
Period 19	
Period 20	
Period 21	
Period 22	
Period 23	
Period 24	
Period 25	
Period 26	
Period 27	
Period 28	
Period 29	
Period 30	
The sum of Your Profits	

Don't fill →

Don't fill the following.

$800 + 10 \times$ [ ] = [ ] yen

(The sum of Your Profits)

3.4 For the No-Outsider/Cost sessions

Record Sheet

ID Number	
Your Cost	

Note: The trading cost is –7.

For Practice

	Your Profit
Period 1	
Period 2	
Period 3	

For Actual Experiment

	Your Profit			Your Profit
Period 1			Period 16	
Period 2			Period 17	
Period 3			Period 18	
Period 4			Period 19	
Period 5			Period 20	
Period 6			Period 21	
Period 7			Period 22	
Period 8			Period 23	
Period 9			Period 24	
Period 10			Period 25	
Period 11			Period 26	
Period 12			Period 27	
Period 13			Period 28	
Period 14			Period 29	
Period 15			Period 30	
		Don't fill →	The sum of Your Profits	

Don't fill the following.

$2000 + 10 \times$ [ ] = [ ] yen

(The sum of Your Profits)

4 Answer Sheet

4.1 Answer Sheet for the Outsider/No-Cost sessions

4.1.1 For 3 subjects

Answer Sheet

Your ID Number: Your Name:

1. Did you understand a procedure and a rule of the experiment before period 1? If you understood them at period 1, answer "Period 1." Otherwise, answer the period you understood them at.

   Period ( )

   If there was anything you didn't understand at period 1, write them below.

2. Under the situation that there were other subjects in the separate room, which offer price did you think the best one to submit is? Answer the concrete number of offer prices. Did you actually submit the best offer price? If you didn't submit the best one, why did you do so? Write the answer below.

3. If the other subjects were not in the separate room, which offer price would you think the best one to submit is? Write the answer (including a concrete number of the offer price) below.

4. What did you talk with other subjects? If you determined your offer price on the basis of the contents of the communication, why did you determine the offer price? Write the answer (including a concrete number of the offer price) below.

5. Write anything (e.g., your impression of the experiments) below.

Thank you very much for participating in our experiment and for answering this sheet. If you have an extra space for answering the above questionnaires, please use the opposite side of this sheet.

4.1.2 For an outsider

Answer Sheet

Your ID Number: Your Name:

1. Did you understand a procedure and a rule of the experiment before period 1? If you understood them at period 1, answer "Period 1." Otherwise, answer the period you understood them at.

   Period ( )

   If there was anything you didn't understand at period 1, write them below.

2. Under the situation that there were other subjects in the separate room, which offer price did you think the best one to submit is? Answer the concrete number of offer prices. Did you actually submit the best offer price? If you didn't submit the best one, why did you do so? Write the answer below.

3. If the other subjects were not in the separate room, which offer price would you think the best one to submit is? Write the answer (including a concrete number of the offer price) below.

4. Write anything (e.g., your impression of the experiments) below.

Thank you very much for participating in our experiment and for answering this sheet. If you have an extra space for answering the above questionnaires, please use the opposite side of this sheet.

4.2 Answer Sheet for the Outsider/Cost sessions

4.2.1 For 3 subjects

Answer Sheet

Your ID Number: Your Name:

1. Did you understand a procedure and a rule of the experiment before period 1? If you understood them at period 1, answer "Period 1." Otherwise, answer the period you understood them at.

   Period ( )

   If there was anything you didn't understand at period 1, write them below.

2. Under the situation that there were other subjects in the separate room, which offer price did you think the best one to submit is? Answer the concrete number of offer prices. Did you actually submit the best offer price? If you didn't submit the best one, why did you do so? Write the answer below.

3. If the other subjects were not in the separate room, which offer price would you think the best one to submit is? Write the answer (including a concrete number of the offer price) below.

4. How did the trading cost of –7 influence on your determination of your offer price? If it has any effects on your determination of your offer price, how did you behave against it?

5. What did you talk with other subjects? If you determined your offer price on the basis of the contents of the communication, why did you determine the offer price? Write the answer (including a concrete number of the offer price) below.

6. Write anything (e.g., your impression of the experiments) below.

Thank you very much for participating in our experiment and for answering this sheet. If you have an extra space for answering the above questionnaires, please use the opposite side of this sheet.

4.2.2 For an outsider

Answer Sheet

Your ID Number: Your Name:

1. Did you understand a procedure and a rule of the experiment before period 1? If you understood them at period 1, answer "Period 1." Otherwise, answer the period you understood them at.

   Period ( )

   If there was anything you didn't understand at period 1, write them below.

2. Under the situation that there were other subjects in the separate room, which offer price did you think the best one to submit is? Answer the concrete number of offer prices. Did you actually submit the best offer price? If you didn't submit the best one, why did you do so? Write the answer below.

3. If the other subjects were not in the separate room, which offer price would you think the best one to submit is? Write the answer (including a concrete number of the offer price) below.

4. How did the trading cost of –7 influence on your determination of your offer price? If it has any effects on your determination of your offer price, how did you behave against it?

5. Write anything (e.g., your impression of the experiments) below.

Thank you very much for participating in our experiment and for answering this sheet. If you have an extra space for answering the above questionnaires, please use the opposite side of this sheet.

4.3 Answer Sheet for the No-Outsider/No-Cost sessions

Answer Sheet

Your ID Number: Your Name:

1. Did you understand a procedure and a rule of the experiment before period 1? If you understood them at period 1, answer "Period 1." Otherwise, answer the period you understood them at.

   Period ( )

   If there was anything you didn't understand at period 1, write them below.

2. Which offer price did you think the best one to submit is? Answer the concrete number of offer prices. Did you actually submit the best offer price? If you didn't submit the best one, why did you do so? Write the answer below.

3. What did you talk with other subjects? If you determined your offer price on the basis of the contents of the communication, why did you determine the offer price? Write the answer (including a concrete number of the offer price) below.

4. Write anything (e.g., your impression of the experiments) below.

Thank you very much for participating in our experiment and for answering this sheet. If you have an extra space for answering the above questionnaires, please use the opposite side of this sheet.

4.4 Answer Sheet for the No-Outsider/Cost sessions

Answer Sheet

Your ID Number: Your Name:

1. Did you understand a procedure and a rule of the experiment before period 1? If you understood them at period 1, answer "Period 1." Otherwise, answer the period you understood them at.

   Period ( )

   If there was anything you didn't understand at period 1, write them below.

2. Which offer price did you think the best one to submit is? Answer the concrete number of offer prices. Did you actually submit the best offer price? If you didn't submit the best one, why did you do so? Write the answer below.

3. What did you talk with other subjects? If you determined your offer price on the basis of the contents of the communication, why did you determine the offer price? Write the answer (including a concrete number of the offer price) below.

4. How did the trading cost of –7 influence on your determination of your offer price? If it has any effects on your determination of your offer price, how did you behave against it?

5. Write anything (e.g., your impression of the experiments) below.

Thank you very much for participating in our experiment and for answering this sheet. If you have an extra space for answering the above questionnaires, please use the opposite side of this sheet.

5. Offer Prices

5.1 The Outsider/No-Cost sessions (The Ceiling Price: 115)

Session 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	104	102	101	101	102	102	102	102	102	102	101	102	102	102	102	102	101	105	101	102	102	101	101	101	101	101	101	100
Subject 2	105	100	102	102	103	102	105	100	100	100	102	101	103	100	101	100	100	100	102	105	100	100	100	100	100	100	101	100
Subject 3	105	105	103	101	101	101	101	102	101	100	110	101	101	101	101	101	100	101	101	101	101	101	101	101	100	101	100	100
Outsider	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	115	100

Session 2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	111	104	105	102	103	105	104	102	103	104	103	105	104	104	104	104	105	105	106	105	106	106	106	106	106	106	107	100
Subject 2	108	106	105	105	105	103	104	103	103	103	103	104	103	104	104	104	105	105	105	105	105	106	106	106	106	106	107	100
Subject 3	107	110	110	110	110	110	104	103	102	103	103	104	104	104	104	104	105	105	105	106	106	106	106	106	106	106	107	100
Outsider	112	105	102	102	103	103	102	103	103	102	103	103	104	103	104	104	104	105	105	105	105	105	106	106	106	107	107	100

Session 3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	115	101	103	103	101	102	103	103	103	103	103	102	102	102	102	102	102	102	103	103	102	103	102	102	102	102	102	100
Subject 2	115	101	101	104	102	102	104	104	103	103	103	102	102	102	102	102	103	102	103	103	103	103	102	101	101	101	101	100
Subject 3	115	101	107	107	102	102	105	105	105	103	103	103	103	103	103	103	103	103	103	102	102	103	102	102	102	102	102	100
Outsider	102	105	104	102	103	103	101	102	103	105	103	104	103	102	102	102	102	102	102	103	103	103	103	103	102	102	101	100

Session 4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	105	101	102	101	101	101	115	100	100	100	100	102	100	109	102	101	101	101	101	101	101	101	101	101	101	101	101	100
Subject 2	105	101	100	101	101	101	101	101	101	101	101	102	101	103	101	102	101	101	101	101	101	101	101	101	101	101	101	100
Subject 3	103	105	105	103	102	102	102	103	102	103	105	104	105	110	110	105	110	102	102	102	103	105	102	101	102	102	101	100
Outsider	107	101	101	101	101	101	101	101	101	100	100	101	101	101	101	100	101	101	101	100	100	101	101	101	101	101	101	100

Session 5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	109	102	102	102	103	102	103	103	103	103	103	103	103	104	103	103	103	103	103	103	103	103	102	103	103	102	102	100
Subject 2	111	107	103	103	103	102	103	103	103	103	103	103	103	103	103	103	104	103	101	103	103	103	103	103	103	103	103	100
Subject 3	110	110	110	110	103	102	103	103	102	104	103	104	103	103	104	103	103	103	104	102	103	103	103	103	103	103	103	100
Outsider	102	101	105	102	101	102	102	102	103	102	103	102	103	103	103	103	103	103	104	102	102	102	103	102	102	103	103	100

5.2 The Outsider/Cost sessions (The Ceiling Price: 115 in session 1, 125 in sessions 2, 3, 4 and 5)

Session 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	100	99	95	94	94	94	94	94	94	95	94	94	94	94	94	94	94	94	94	95	94	94	94	94	94	94	94	100
Subject 2	100	97	95	94	94	94	94	94	94	95	94	94	94	94	94	94	94	94	94	95	94	94	94	94	94	94	94	100
Subject 3	100	97	94	95	95	93	94	94	94	95	95	94	95	94	94	94	94	94	94	95	94	94	94	94	94	94	94	100
Outsider	102	98	95	92	93	94	93	94	94	95	96	95	94	94	94	94	93	94	94	94	94	94	94	94	93	94	94	100

Session 2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	113	107	110	105	110	108	107	109	108	108	110	110	112	112	112	112	113	114	113	114	115	115	115	114	114	115	115	110
Subject 2	115	106	105	108	112	110	107	109	108	108	110	110	112	111	112	114	113	114	114	114	114	115	115	115	115	115	115	110
Subject 3	111	104	110	105	115	110	111	110	108	108	111	110	111	111	112	113	113	114	114	114	115	115	116	116	115	115	116	110
Outsider	105	108	107	107	106	107	109	107	108	109	109	110	110	111	112	112	113	113	114	114	114	115	114	115	115	115	115	110

Session 3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	108	109	105	104	104	104	104	104	120	104	104	114	104	122	104	119	104	118	104	117	104	112	104	121	104	116	104	110
Subject 2	112	105	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	110
Subject 3	111	110	104	104	104	104	104	103	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	110
Outsider	109	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	110

Session 4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	105	105	104	104	104	104	104	104	115	110	104	104	104	104	104	104	110	110	110	110	110	110	105	104	105	105	105	110
Subject 2	111	110	105	103	104	104	103	103	110	105	106	106	104	104	104	105	105	105	105	105	105	105	105	105	105	104	105	110
Subject 3	104	109	104	104	104	110	104	105	107	110	105	104	105	111	111	111	105	105	104	111	105	105	110	105	105	105	105	110
Outsider	105	104	104	107	105	104	105	104	104	104	104	104	104	104	104	105	104	104	105	104	104	105	104	105	104	104	104	110

Session 5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	111	111	125	111	110	110	105	105	105	105	105	105	105	105	105	125	125	125	125	145	145	125	125	125	125	125	125	110
Subject 2	110	111	109	109	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	110
Subject 3	115	112	109	108	105	105	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	110
Outsider	110	110	110	107	106	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	110

5.3 The No-Outsider/No-Cost sessions (The Ceiling Price: 115 in sessions 1, 2 and 3, 125 in sessions 4 and 5)

Session 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	108	108	105	110	105	104	108	108	106	105	105	105	107	106	115	108	105	104	104	115	115	115	110	110	110	115	106	100
Subject 2	105	106	111	109	107	107	115	105	106	104	105	107	105	105	115	115	104	103	107	115	115	115	111	112	110	115	105	100
Subject 3	107	107	105	106	108	107	107	109	106	107	105	107	107	106	115	105	105	105	105	115	115	115	110	110	112	115	110	100

Session 2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	115	120	120	115	115	115	115	115	115	115	115	120	115	120	120	115	115	115	115	115	115	115	115	120	115	120	120	100
Subject 2	115	115	115	115	120	120	115	115	120	115	120	120	115	115	115	115	120	120	115	120	120	115	115	115	115	115	120	100
Subject 3	115	115	120	115	115	135	115	135	116	115	115	115	115	115	118	115	115	123	115	115	135	115	115	120	115	115	115	100

Session 3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	116	117	115	118	119	115	120	121	115	122	123	115	124	125	115	126	127	115	128	129	115	115	115	115	115	115	115	100
Subject 2	120	115	120	120	115	120	120	115	120	120	115	120	120	115	120	120	115	120	120	115	120	115	115	115	115	115	115	100
Subject 3	115	250	120	115	117	120	115	130	135	115	123	132	115	120	127	115	118	116	115	120	122	115	115	115	115	115	115	100

Session 4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	125	127	130	125	140	140	125	130	130	125	130	130	125	130	130	125	130	130	125	135	135	125	140	140	125	140	140	110
Subject 2	145	125	126	130	125	144	141	125	129	130	125	132	130	125	135	130	125	135	145	125	133	130	125	132	130	125	140	110
Subject 3	130	130	125	130	130	125	130	130	125	130	130	125	130	130	125	130	130	125	130	130	125	130	130	125	130	130	125	110

Session 5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	130	130	125	135	138	125	126	127	125	138	140	125	142	127	125	129	132	125	139	140	125	128	135	125	140	130	125	110
Subject 2	126	125	128	130	125	130	130	125	130	130	125	135	130	125	145	126	125	130	130	125	130	130	125	130	130	125	130	110
Subject 3	125	145	126	125	126	140	125	145	126	125	129	130	125	145	140	125	127	129	125	127	126	125	128	130	125	126	139	110

5.4 The No-Outsider/Cost sessions (The Ceiling Price: 125)

Session 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	125	110	109	125	130	130	125	130	130	125	130	130	125	130	130	125	130	130	125	130	130	106	125	105	106	104	130	110
Subject 2	125	106	104	126	125	126	126	125	126	126	125	126	126	125	126	126	125	126	126	125	124	108	104	110	105	104	125	110
Subject 3	122	119	111	129	126	125	126	126	125	126	126	125	126	126	125	126	126	125	126	126	125	118	104	104	104	104	126	110

Session 2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	125	130	130	125	130	130	130	125	130	130	125	130	130	125	130	130	125	130	130	125	130	130	125	130	130	125	130	110
Subject 2	130	125	130	130	125	130	130	130	125	130	130	125	130	130	125	130	130	125	130	130	125	130	130	125	130	130	125	110
Subject 3	130	130	125	130	130	125	130	130	130	125	130	130	125	130	130	125	130	130	125	130	130	125	130	130	125	130	130	110

Session 3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	120	115	117	125	135	140	125	130	140	125	135	135	125	135	140	125	135	145	125	145	145	125	135	140	125	135	140	110
Subject 2	115	120	115	126	125	130	130	125	130	130	125	130	130	125	130	130	125	130	130	125	130	130	125	130	130	125	138	110
Subject 3	120	117	115	130	145	125	130	130	125	126	135	125	130	130	125	128	130	125	130	130	125	130	130	125	130	130	125	110

Session 4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	118	115	115	119	119	119	125	120	119	125	119	120	125	120	120	125	120	120	125	120	120	125	120	120	125	120	120	110
Subject 2	112	114	113	120	119	121	125	118	120	125	120	118	125	119	118	125	120	119	125	121	121	125	119	120	125	119	120	110
Subject 3	115	111	115	118	120	120	125	120	119	125	120	120	125	119	118	125	120	121	125	120	119	125	121	119	125	120	120	110

Session 5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Your Cost
Subject 1	145	125	145	125	145	145	113	109	107	125	145	145	145	145	125	125	125	125	125	110	107	145	145	125	125	125	125	110
Subject 2	125	145	143	137	127	125	117	111	105	138	144	125	125	126	134	125	125	125	125	117	119	145	125	127	125	125	124	110
Subject 3	127	130	125	130	125	130	112	114	108	130	125	130	130	125	130	125	125	125	115	112	108	125	130	130	125	125	125	110