Voice Matters in a Dictator Game

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We examine a dictator game with a "voice" option in the laboratory. In our experiment, the recipient has an opportunity to state a payoff-irrelevant request for the minimum acceptable offer before the dictator dictates his/her offer. In this game, it is predicted not only by the standard game theory, but by the behavioral game theory such as theories of other-regarding preferences, that the dictator's offer is independent of the recipient's request. Some findings based on our data are as follows: the above independence hypothesis is rejected; as the recipient's request increases, the dictator's offer increases when the requests are less than 50% of the pie; on the other hand, when the request goes beyond 50% of the pie, the offer decreases as the request increases. That is, "voice" matters in a dictator game. We also conduct a clustering analysis to classify the dictators into three notable clusters: the pecuniary payoff maximizers, the compliers, and the punishers of the greedy.

1. Introduction

People often express their demands and dissatisfaction through voice. Some voice such as complaint to a friend about one's boss is an expression of frustration, which directly and psychologically eases one, at least to some extent, while some other voice indirectly increases one's utility by affecting others' behavior. The present paper studies the latter, strategic and/or economic, effects of voice that does not affect one's utility in a direct or psychological manner.

Hirschman (1970) pointed out the importance of voice in economic settings. He examined and emphasized the effects that the voice of customers and employees has on the quality of products and services which are deteriorated by the negligence of a firm manager.

Hirschman discussed a wide range of phenomena from a mere complaint of a customer to a legal action taken by an insider. His argument, however, does not give us clear answers to some questions concerning the mechanism through which and the extent to which voice affects others' behavior.[1]

Lately, game theory pointed out two functions of voice in strategic situations. The first function is to convey one's private information to the other. One would say in a

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[1] Recently, Banerjee and Somanathan (2001) provided a theoretical model of Hirschman's notion of voice. Their model is an extension to Crawford and Sobel (1982) in a way that there are multiple senders and a receiver who possess different priors on the state of the world. In their model, the receiver is a leader in a business or political organization and has control power to make payoff relevant decision whose outcomes affect all the members of the organization. So the senders would like to influence the receiver's posterior to let the receiver lead to make favourable decision to them.

football game, “A man on (A man is behind you)!” This voice conveys one’s private information (the opponent’s coming from behind) and may have a force to have the teammate avoid the tackle. The sender of this message expects the receiver to watch behind. In some other cases, there may be a conflict of interests between the sender and the receiver of messages. Crawford and Sobel (1982) examined such a strategic aspect of voice as information transmitting device. Warneryd (1991) studied the evolutionary mechanism in which voice comes to have this function. Dickhaut et al. (1995) and Kawagoe and Takizawa (1999) showed that cheap talk can convey one’s private information and facilitate coordination in the Sender-Receiver Game experiment only if both players’ interests are sufficiently aligned.[2]

Second, voice sometimes conveys one’s intention for the future actions. A person who incurred a loss due to another person's negligence may say “Compensate for the loss, or I'll sue you!” This request hints that the utterer may take a legal action if this request is rejected. If this threat is real, the person who caused the loss may agree to pay some compensation. Also, the request “Cooperate as I cooperate, too!” in a repeated prisoners' dilemma draws cooperation from the opponent by telling one's intention. This request is collateralized by the future (credible) punishment. Forges (1986) studied communication device in a one-shot game, while Kandori and Matsushima (1998) studied a coordination role of cheap-talk in a repeated situation. Matsui (1991) studied the evolutionary process in which cheap-talk gains some meanings in a random matching situation.[3] On the other hand, with one-sided communication, Cooper et al. (1989) shows that cheap talk conveying one’s intention of future play can resolve

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[2] Also, see Blume et al.(1998) for an experimental study on the evolution of the meaning of cheap talk. See a survey by Crawford (1998) and Camerer (2003) for detail.

[3] See also Farrell (1987) and Kim and Sobel (1995).

coordination problem in the Battle of Sexes Game experiment even in a one-shot environment.[4]

Thus, it has been shown in the laboratory settings as well as in theory that voice conveys both private information and one's intention of the future action. In these studies, voice serves coordination device. A flip side of this observation is, as claimed by Crawford and Sobel (1982), that a coordination aspect is needed to make voice valid. In reality, however, we encounter situations with a conflict of interests in which voice seems to matter. For example, people sometimes ask passers-by for a contribution. We know from our experiences and observations that these requests are sometimes effective.

Of course, even in such a case, we can still think that they have a common interest to some extent since the pecuniary payoff is not all that matter. Indeed, in the above case, we may suppose that voice carries the first function: the sender transmits information regarding the type of public good, and the receiver makes a private contribution to this particular good if he likes it. Nor can one reject the hypothesis that the receiver may follow the request as he feels like having his conduct observed by his friends, or he cares about a possible future encounter with the sender. We cannot entirely remove the effects of voice as coordination device.

It is the purpose of the present paper to induce an environment free of these functions as much as possible by conducting a laboratory experiment and test the effects of voice therein.

To this aim, we consider a dictator game with a "voice" option in the laboratory. In the dictator game, the dictator dictates how to divide a pie, and the recipient simply

[4] See also a survey by Crawford(1998) and Camerer (2003) for detail.

receives his/her share, i.e., unlike in an ultimatum game, he/she does not have an option to reject this division. In our experiment, the recipient has an opportunity to state a payoff-irrelevant request for the minimum acceptable offer before the dictator dictates his/her offer. In the dictator game with a voice option, the recipient's voice is not considered as a hint of the future action because he\she can't take any action after he/she states it. Furthermore, his/her voice doesn't convey any private information because the payoff function of this game is common knowledge among players.[5] Therefore, we can identify other effect of voice other than those mentioned before if we observe that voice matters in the dictator game with voice option. Therefore, this game is appropriate for our study of voice.

In this game, it is predicted not only by the standard game theory, but by the behavioral game theory such as the theory of other-regarding preferences, that the dictator's offer is independent of the recipient's request.[6] Some findings based on our data are as follows: the independence hypothesis is rejected; as the recipient's request increases, the dictator's offer increases when the requests are less than 50% of the pie; on the other hand, when the request goes beyond 50% of the pie, the offer decreases as the request increases. That is, "voice" matters without two channels such as information transmission and a hint of the future action. We also conduct a clustering analysis to find three notable different tendencies among dictators' behavior.

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[5] In our experiment, all subjects were in one room, and instructors read aloud the instruction of the experiment so that the structure of our game is common knowledge among subjects. See also the section of Experiment.

[6] See, e.g., Fehr and Schmidt (1999) and Bolton and Ockenfels(2001) for "outcome-based" models, and Rabin(1993) and Dufwenberg and Kirchsteiger (1998) for "intention-based" models.

In our experimental setting, we adopted the strategy method: a subject who is selected by lottery to be a dictator is asked to determine a strategy, or a contingent plan, which prescribes the share to be given to the recipient for each possible request. This method enables us to study an individual behavior pattern of each subject as opposed to the aggregate pattern.

We use a clustering method to discern three representative behavior patterns:

(i) [*the pecuniary payoff maximizers*] 9 out of 39 subjects belong to this cluster. The representative pattern of this cluster is to give no share to the recipient, which corresponds to a Nash equilibrium of the dictator game with a voice option;

(ii) [*the compliers*] 14 out of 39 subjects belong to this cluster. The representative pattern of this cluster is to comply with the request up to 50% and keep 50% beyond it; and

(iii) [*the punishers of the greedy*] 16 out of 39 subjects belong to this cluster. The representative pattern of this cluster is to comply with the request up to 50% and decrease the share to be given as the request increases beyond 50%.

Thus, we found some evidences that voice matters in the dictator game. There are related papers examining the effects of voice other than conveying one's private information and one's intention of future play.

Schotter and Sopher (2003) conducted the Battle of Sexes Game experiment in the intergenerational environment. In their experiment, subjects belong to each generation without overlapping and then play the game repeatedly in their generation. Then subjects in each generation were able to give advice to their successors. They reported that such a word-of-mouth social learning can be a strong force in the creation of social conventions. Advice in their experiment is really voice that we will study in this paper. Because neither advice is cheap talk conveying one's intention of future play so that subjects in previous generation have no payoff relevant action to the next generation, nor advice is cheap talk conveying private information so that there is no private information in the Battle of Sexes Game. Compared with our one-shot environment, they focused on the effect of voices that were accumulated generation to generation.

Fehr and Rockenbach (2003) examined whether the existence of sanction alter the behavior in the trust game experiment. In their experiment, the first players were forced to specify how much amounts they were willing to receive from the second players as back-transfers when the first players divided their pies to give the second players. In the one condition (Incentive condition), the first players were allowed to make fines on the second players if they did not give desired back-transfers, that the first player specified, to the first players. In addition, whether fines were imposed was declared before the second players made their decisions. In the other condition (Trust condition), the first players were not allowed to make any fine. Remarkable findings in their experiment are that back-transfers decreased as desired-back-transfers increased in the Trust condition and the Incentive condition when fines were imposed, and that back-transfers increased as desired-back-transfers increased in the Incentive condition when fines were not imposed. Declaring one's desired back-transfer is actually voice in the sense of our experiment. One could see the dictator game is a part of trust game, that is, the subgame beginning from the second player turn is exactly same with the dictator game. So we cannot distinguish purely the effect of voice from forward induction or "burning money" effect in their environment. On the other hand, we can see purely the effect of voice in our environment.

The rest of the paper is organized as follows. The next section explains the structure of the game with voice option, game theoretic predictions for it and our independence hypothesis formally. Section 3 explains our experimental procedures. Section 4 states and studies our experimental results. Section 5 provides some concluding remarks. Appendix contains instructions, recording sheets, and raw data.

Design

We examine a dictator game with a “voice” option in the laboratory. In the dictator game, the dictator dictates how to divide a pie, and the recipient simply receives his/her share, i.e., unlike in an ultimatum game, he/she does not have an option to reject this division (see Figure 1). The size of a pie is 1,000 yen in our experiment. In the dictator game with a “voice” option, the recipient can either tell his/her minimum acceptable offer (MAO) to the dictator or simply choose “not to tell,” denoted by ϕ, before the dictator dictates his/her offer (see figure 2.). MAO has to be between 0 and 1,000 yen with the step-size of 100 yen. A generic element of the dictator’s offer is denoted by *x*, while MAO is denoted by *y*. The dictator can condition his offer on MAO. If the actual offer of the dictator is *x*, then the dictator receives (1,000-*x*) yen, and the recipient *x* yen as their rewards, respectively.

Figures 1 and 2 are here.

Denote by $p_x(y)$ the probability that a dictator chooses *x* in response to $y \in Y \equiv \{\phi, 0, 100, \ldots, 1{,}000\}$. Then, $P(y) = (p_0(y), \ldots, p_{1,000}(y))$ gives a conditional probability distribution of the dictators’ choice in response to *y*. Let $P = (P(y))_{y \in Y}$ be a tuple of such conditional distributions.

Our main interest is to see whether or not voice matters in the dictator game, and if it does, how. For this purpose, we first test the following null hypothesis that conditional distributions $P(\phi)$ and $P(y)$'s are identical. We call this hypothesis the Independence Hypothesis (IH):

(IH) $P(\phi) = P(0) = P(100) = ... = P(1000)$.

Next, we consider some game theoretic predictions of our dictator game with a voice option. First, P with $P(y) = (1,0,\ldots,0)$ for all $y \in Y$ is the unique Nash equilibrium. In this equilibrium, the dictator keeps the whole pie regardless of the request of the recipient. However, several experimental researches found that the dictator often deviates from the equilibrium and makes a "fair" offer to the recipient in the laboratory (for example, Kahneman, Knetsch and Thaler (1986), Forsythe, Horowitz, Savin and Sefton (1994), Andreoni and Miller (2000) and others).

Several theoretical attempts have been made based on other-regarding preferences to explain such deviations.[7] We categorize these theories of other-regarding preferences into two. One is the consequentialistic, or the outcome-based, model according to which players, who care about other players' payoffs, pay attention to a realized outcome only. Even though a player's interest lies only in the realized outcome, this model can explain both altruistic behavior and spite behavior (Bolton and Ockenfels (2001), Fehr and Schmidt (1999)). The other is the reciprocal, or the intention-based, model according to which players pay attention not only to the realized outcome but also to opponents' intention behind the process inducing that outcome. This model can explain both positive and negative reciprocity (Rabin (1993), Dufwenberg and Kirchsteinger (1998)).

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[7] See more details in the survey of Fehr and Schmidt (2000) and Camerer (2003).

In our dictator game with a voice option, every subgame beginning with the recipient's move is identical, so the outcome-based model as well as Nash equilibrium supports the Independence Hypothesis. In other words, voice does not affect the choice of the dictator's offer in our game. Of course, the shape of the dictator's choice distributions, $P(y)$, themselves depends on the parameters of the dictator's utility function.

Furthermore, the intention-based model also supports the Independence Hypothesis. The positive reciprocity that returns kindness against kind behavior and the negative reciprocity that returns unkindness against unkind behavior are key features of the intention-based model. Such reciprocal behavior cannot be an equilibrium in the dictator game with a voice option. Since the dictator game with a voice option is a zero-sum game, the dictator thinks that the recipient's behavior is "kind" only if he makes an "unkind" offer to the recipient; on the other hand, the dictator thinks that the recipient's behavior is "unkind" only if he makes a "kind" offer to the recipient. In fact, a fairness equilibrium in the sense of Rabin (1993) and Dufwenberg and Kirchsteiger (1998) predicts that $P(y) = (1,0,\ldots,0)$ for all *y*.

In summary, both Nash equilibrium and the intention-based model predict $P(y) = (1,0,\ldots,0)$ for all *y*. In the outcome-based model, the dictator's choice distribution, $P(y)$, can be affected by the parameters of utility functions. However, voice has no effect on equilibrium plays in our dictator game, either.

Experiment

Our experiment was conducted at the University of Tokyo, Komaba Campus, on October 23, 2003. Subjects were undergraduate students in the class of "Corporate Economics" in the Department of Liberal Arts. Most of the students were sophomore, took microeconomics in the previous semester, and would become economics major.

They were supposed to learn game theoretic concepts like subgame perfection in this class, though they had not learned either subgame perfection or backward induction at the time of experiment. They hadn't participated in any formal experiment in economics prior to this one. 80 out of 390 students were selected at random.

In the beginning of the experiment, each subject was distributed an envelope that contains all the experimental materials such as instructions, a recording sheet, a practice problem, and an identification number card. The subjects to whom an odd number is given as an identification number were dictators, and the others were recipients.[8] The identification numbers were also used to determine pairs in the actual experiment. The identity of the opponent in a pair was informed neither publicly nor privately, and subjects were assigned their seats at random so that we keep subjects' identities as anonymous as we can.

To remove any experimenter's effect without employing double blind method, we used volunteers other than the researchers as instructors in this experiment. [9] One of the

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[8] Of course, we did not use terms ``Dictator'' and ``Recipient'' in the actual experiment at all. Instead, we use ``Player 1'' as a dictator and ``Player 2 '' as a recipient.

[9] As is well known, Hoffman, McCabe, Shachat and Smith (1994) developed a double blind method to keep anonymity among subjects as well as between experimenters and subjects, and it become standard method to conduct bargaining experiment such as the ultimatum game, the dictator game, trust game etc. Unlike their experimental design, we employed the one room experiment as mentioned above that all subjects were in the same room. Our design is reflected by a confounding effect of double blind method reported by Frohlich, Oppenheimer, and Moore (2001). They pointed out that double blind experiments might endanger doubts in subjects regarding the existence of pairings and the disposition of any money they share.

instructors read aloud the instructions of the experiment. Written instructions were also distributed to each subject. Before the actual experiment, subjects were told to solve practice problems to confirm their understandings of our dictator game and the instructions of the experiment.

In the actual experiment, we followed the strategy method.[10] That is, a dictator and a recipient made decisions simultaneously as follows. The recipient chose between "to tell MAO" and "not to tell." If he/she decided "to tell MAO," the amount of MAO, y, was chosen as well. The dictator dictated his/her offer, *x*, for each possible choice of the recipient before he/she knew the actual choice made by his/her opponent. These decisions were made once and for all. The experiment was conducted manually. Session time was about one and half hours and twenty minutes was spent for instruction and practice. The average reward was about 1,000 yen and the participation fee, 500 yen, is included. The reward was paid in cash privately to each subject about one hour after the experiment.

Results

We use 39 pairs of data for our analysis because one of them was incompletely written. To see how the dictators responded to the voice of the recipients, the relative frequency table is given in Table 1.[11] The column is the recipient's choice, $y \in Y$, and the raw is the amount of the offer made by the dictator, *x*. Each column can be regarded as a sample population density for each *y*. There are 39 data for each *y* because the dictators made their decisions against all *y*'s under the strategy method. It seems that each sample population density is different for each *y*. As representative cases, let us

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[10] See more details of strategy method in Selten (1967).

[11] See also Figure 3 that describes the relative frequency of *x* for each *y*.

focus on the cases of $y = \phi$ and y = 500. In each case, the amount of offer made by a dictator, x, is distributed between x = 0 and x = 500. While x is concentrated near x = 0 for $y = \phi$, x is distributed around x = 500 for y = 500. Furthermore, over 50% of the offers satisfy $x = y$ for y between 0 and 500. That is, almost a half of the offers made by the dictators are equal to MAO if MAO is less than or equal to a half of the pie. If MAO exceeds 50% of the pie, this tendency disappears; the amount of the offer made by a dictator decreases as MAO increases. The greater MAO is, the larger the variance of the distribution becomes.

Table 1 is here.

To see more details of the distributions of x, a box plot is shown in figure 3. In this box plot, the vertical-axis is the amount of x and the horizontal-axis is MAO. The top line of the box corresponds to the third quartile (75% percentile), the bottom line of the box to the first quartile (25% percentile), the line within the box to the median. In the case that the third quartile is equal to the median, we put a dark mark on the line. The line segments associated with the top and the bottom of the box shows the maximum and the minimum values, respectively. The mode is shown as a triangle. Next, let us confirm our general findings mentioned above using this box plot.

Figure 4 is here.

At $y = \phi$, one can see that the distribution of x is concentrated on 0 since the median and the mode is at x = 0. On the other hand, at y = 500, the distribution is centered around 500 since the mode is x = 500 and the median is also close to it (400). We can also see that the median monotonically increases between y = 0 and 500 and decreases between y = 600 and 1000. Furthermore, note that the third quartile, the median, and the mode are all equal to *y* between *y*=0 and 400. On the other hand, the distribution tends to decline toward the mode, *x* =0, when *y* is greater than 500.

Now, we use the Friedman two-way analysis of variance by ranks to test the null hypothesis that the twelve responses to the voice have been drawn from the distributions with the same median.[12] To do it, we first transform each individual's data into ranks, i.e., we rank each response from the first to the twelfth.[13] Let M_j be the median of the responses to the voice *j* ($j=\phi$, 0, 100, …,1000). Then the null hypothesis is written as:

$$H_0: \quad M_\phi = M_0 = M_{100} = \cdots = M_{1000}$$

and the alternative hypothesis is:

$$H_1: \quad M_u \neq M_v \quad \textit{for some u and v.}$$

The Friedman's value after adjusting ties approximately follows a χ^2 distribution for the present data set with $df = 11$. The value we obtained is

$$F_r = 114.04,$$

which exceeds the critical value 31.26 for the significance level of 0.001. Thus, we reject the null hypothesis. In other words, voice matters in the present game.

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[12] See Siegel and Castellan (1988) for the Friedman two-way analysis.

[13] If there is a tie, give them an average rank. For example, the data (0,0, …,0) is transformed into (6.5, 6.5, …, 6.5), and (5, 10, 5, 2, 2, …,2) to (2.5, 1, 2.5, 8, 8, …, 8).

Since we obtain the significant result, we proceed to the multiple comparisons. The absolute differences of the sums of the ranks for the pairs of *y*'s in *Y* are shown in Table 3.[14] Three notable tendencies are the following:

(1) the response (offer) to a "modest" request is significantly below that to a request for a relatively "fair" division;

(2) the response to "not-to-tell" is significantly below that to a request for a relatively "fair" division; and

(3) the response to an "aggressive" request is significantly below that to a request for a relatively "fair" division.

Combining this test with the earlier observations of the present section, we may conclude that a dictator tends to give more to a recipient if the request is a "fair" one than otherwise.

Table 3 is here.

So far we have paid attention to the aggregate behavior of the subjects. From now on, we would like to see the individual behavior. In doing so, we will classify the subjects' behavior into some prominent patterns, or clusters. Since there is no theory, to

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[14] Each absolute difference follows a normal distribution with a proper variance. The critical value is the abscissa value from the unit normal distribution above which lies 0.05/(11*12) percent of the distribution. Note that in the present context, the Friedman analysis of variance is more suitable than the standard analysis of variance for a randomised block design with one treatment variable experiment since we do not presuppose that samples are from the normal distribution. It should be noted here that the standard analysis of variance induced the wider range of pairs that lead to significant differences.

the best of our knowledge, to give us clear understandings of our results, such a clustering analysis may help us to develop the basis of our future modelling of the subjects' behavior.

Note that, according to Figure 3, the first quartile is 0 for any *y* and that at least 25% of the offers are 0 for each *y* even though the mode is equal to MAO in the case of $0 \le y \le 500$. So one can deduce from these aggregated data that there are at least 25% of subjects who offer 0 in the case of $0 \le y \le 500$. On the other hand, the variances of the distributions are still large though the mode is 0 and the distribution tends to biased toward 0 in the case of $600 \le y \le 1000$. According to Table 1, at least 25% of offers are $x = 500$ for any *y* between 600 and 1000. Therefore, one can deduce from these aggregated data that there are at least 25% of the subjects who offer 500 if $600 \le y \le 1000$ holds.

To confirm these observations, we use a stratified clustering analysis of Ward to differentiate some behavior patterns.[15] The tree-shaped diagram representing a clustering process is shown in Figure 10. There are three clusters obtained at the stage indicated by the bold line in Figure 5. Subjects belong to these three clusters are called the *pecuniary payoff maximizers*, the *compliers*, and the *punishers of the greedy*, respectively. We examine the dictators' behavior in each cluster by using the box plots.

Figure 6 is here.

The first cluster (the pecuniary payoff maximizers): Nine subjects, or 23% of the whole subjects, belong to this cluster. The box plot of dictators' choices for each y is shown in Figure 6. The subjects' behavior, choosing 0 for any y, are consistent with the

[15] See more details of Ward's method in Anderberg (1973).

unique Nash equilibrium. Thus, the reason that the first quartile is always 0 in the aggregated data is that subjects who belong to this cluster always choose 0.

Figure 7 is here.

The second cluster (the compliers): Fourteen subjects, or 36% of the whole subjects, belong to this cluster. The box plot of dictators' choices for each y is shown in Figure 7. First, the median and the mode coincide with those in aggregated data for $y = \phi$ and $0 \leq y \leq 500$. The representative dictator in this cluster offers $x = y$, i.e., the offer is equal to the request, if $0 \leq y \leq 500$. We cannot identify any representative feature in the case of $y = \phi$ since a large variance of offers is observed in this case. On the other hand, the median and the mode of dictators' offers in the case of $600 \leq y \leq 1000$ are almost equal to 500 and the variance of the distribution is rather small. It means that the representative dictator offers $x = 500$ regardless of MAO if it exceeds 500.[16] The reason that the offer of $x = 500$ does not disappear in the aggregated data even though the distribution tends to be biased toward $x = 0$ in the case of $600 \leq y \leq 1000$ is that the subjects in this cluster always choose $x = 500$ regardless of MAO.

Figure 8 is here.

The third cluster (the punishers of the greedy): Sixteen subjects, or 41% of the whole subjects, belong to this cluster. The box plot for dictators' choices for each y is shown in Figure 8. Comparing Figures 3 and 8, one may realize that the median and the

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[16] One may think that 500 yen or a half of the pie is reserved in subject's mental accounting to help the other players as suggested by a fixed total sacrifice theory reported in the Selten and Ockenfels (1998)'s solidarity game experiment.

mode in this cluster are almost the same as those in the aggregated data. As in the second cluster, the representative behavior in this cluster is that *x*=*y* holds, i.e., the dictator offers the same amount as MAO, if $0 \le y \le 500$. We do not identify any representative feature for $y = \phi$ since a large variance of offers is observed for this case. There seem to be two subclusters in this cluster for $600 \le y \le 1000$, though we do not conduct a formal clustering analysis to find them. In one subcluster, the dictator always offers *x* = 0, while in the other, the dictator gradually decreases the amount of offer as the request increases. In fact, there exist two modes at *y* = 600 and 700. If *y* is greater than 700, the mode is *x* = 0 only, but the median tends to decrease relatively slowly. Anyway, a decreasing tendencies of offers beyond *y=500* are the representative behavior in this cluster.

In summary, we have identified three behavior patterns through the clustering analysis of Ward. The game theoretic player offers *x* = 0 regardless of MAO. The complier complies with the request if it is below 500 and keeps the amount *x* = 500, otherwise. The punisher of the greedy complies with the request up to the equal allocation and decreases the offer *x* as the request y increases beyond it. The patterns that reject the Independence Hypothesis are the last two, which comprise of 77% of the whole subjects. In both patterns, the representative behavior is to comply with the recipient's request if $0 \le y \le 500$.

Figure 9 is here.

Finally, the relative frequency of recipients' choices is shown in Figure 9. At a glance, the distribution is centered around *y* = 500. Thus, most of the recipients correctly chose MAO that maximizes their payoffs based on the expectation of dictators' behavior mentioned above.

Conclusions

In this article, we studied a dictator game with voice option and analysed the effect of such payoff-irrelevant voices. In our experimental results, the voice of the recipient can have significant effect on determining the allocation of the pie even though the recipient has no control power on the allocation. Further, the amount of offers made by dictators is increasing with respect to MAO when MAO lies between 0 and 500 yen. On the other hand, the amount of offer tends to decrease relatively slowly beyond 500 yen.

In our experiment, we follow the strategy method. In the strategy method, dictators forced to specify their actions for every possible y before they observe real choices of recipients. By that method, we could obtain dictators' reactions for each value of y. If we don't follow the strategy method but the sequential method, that is, when dictators choose their offers after they observe MAO stated by recipients, there is no guarantee that subjects behave same way in our experiment that employs the strategy method[17].

There are many dictator games experiments in the literature. For example, Hoffman, McCabe, Shachat and Smith (1994), employing double blind method to keep anonymity among subjects as well as between experimenters and subjects, found that subjects offer the amount that is closer to the Nash equilibrium than those of previous experiments reported. In our experiment, we also follow double blind method. Hoffman et al. (1994) also introduced endowment effect by which they assigned the right to be the dictator to the winners for simple intellectual tasks. Such arrangements may induce

[17] Brandts and Charness (2000) reported the differences of subjects behaviors between hot (sequential method) and cold (strategy method) experiments.

selfish behavior in their experiment. One can ask us whether our results may change by introducing endowment effect as well as double blind method.

Bohnet and Frey (1999) considered the environment in which the dictator can see the identity of the recipient but the recipient cannot. When the dictator hears the recipient's opinion about him/her in such an environment, they reported that the dictator behaves more selfishly. If we can regard our y = "not to tell" case as ordinary dictator games, we also have more selfish behavior in the case of y = "to tell," especially y = 500. Of course, if altruism is based on the cognition of the existence of others as Nagel (1970) said, voice of the recipient may contribute to inform the dictator the existence of the recipient. But important thing is not that altruism is invoked by the recipient's voice but that the dictator's behavior changes according to the recipient's voice. So it is necessary to check that voice can change dictators' behavior even though the experimental environment induces more altruistic behavior.

As we see in the previous section, our experimental results can be explained neither by the standard game theory nor by the behavioral game theory. Indeed, neither the "outcome-based model" that players only care about the pecuniary outcome of the game nor the "intention-based model" that incorporates players' reciprocal intentions explains our results. In these models, players' preferences or motivations are based solely on the outcomes of the game and available strategies. But, as Gintis (2000) stressed, we cannot separate subjects' preferences and motivations from their social experiences that are obtained before they enter the laboratory. Following this view, we must note that it might be dangerous for us to explain our experimental results solely by the structure of the game.

A reasonable explanation might be that the subjects apply their past experiences to the present experimental task. They search similar social situations applicable to the present experimental task that they face. Then they apply appropriate behavioral norms, which have been suitable for their past experiences, to the current situation. In this way, subjects choose their strategy choices. We learn some norms or behavioral principles from various social experiences. For example, consider the following commandment in the bible or the golden law of morality, “just as you want men to do to you, you also do to them likewise[18].” Such a behavioral norm is different from a strategy in the sense of game theory since this norm does not address to a specific person but to anonymous, and what is good to do depends on others’ wants. But it is possible that subjects use such a behavioral norm in the experiment.

[need one sentence or paragraph]

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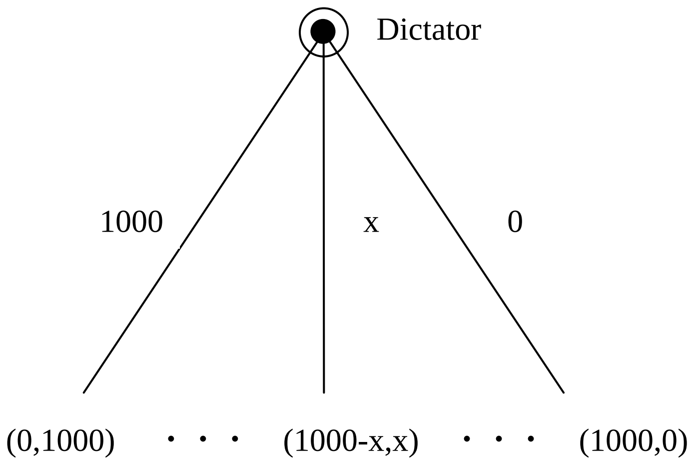
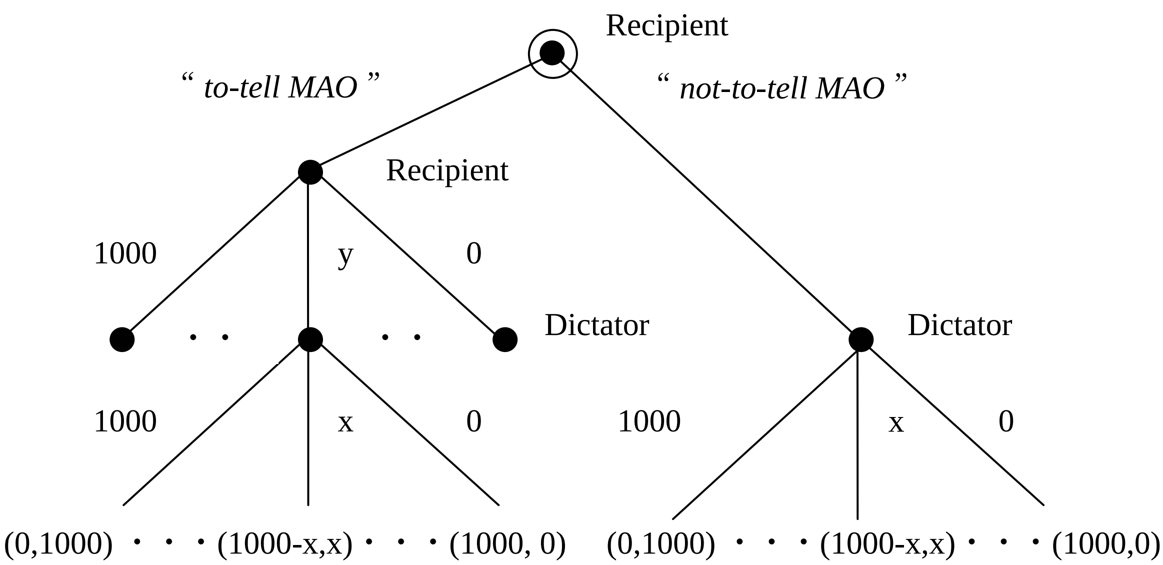
Figure 1: Dictator game



The left hand side (*resp.* right hand side) of parentheses represents the dictator's payoff (*resp*. the recipient's payoff).

Figure 2: Dictator game with a "voice" option



The left hand side (*resp.* right hand side) of parentheses represents the dictator's payoff (resp. the recipient's payoff).

Table 1: Relative frequency of x for each y												
x \ y	not-to-tell	0	100	200	300	400	500	600	700	800	900	1000
0	69.2	82.0	28.2	25.6	25.6	25.6	25.6	33.3	38.4	41.0	41.0	64.0
100	5.1	7.7	69.2	7.7	2.6	0	2.6	5.1	2.6	0	15.4	5.1
200	2.6	7.7	0	58.9	5.1	5.1	5.1	5.1	5.1	15.3	5.1	2.6
300	2.6	0	2.6	2.6	64.1	12.9	10.3	15.4	20.5	10.3	5.1	2.6
400	7.7	2.6	0	2.6	0	51.3	10.3	12.9	10.3	7.7	7.7	2.6
500	10.2	0	0	2.6	2.6	5.1	46.1	23.1	17.9	17.9	20.5	15.3
600	0	0	0	0	0	0	0	5.1	2.6	2.6	0	0
700	0	0	0	0	0	0	0	0	2.6	2.6	2.6	2.6
800	0	0	0	0	0	0	0	0	0	2.6	0	0
900	0	0	0	0	0	0	0	0	0	0	2.6	2.6
1000	2.6	0	0	0	0	0	0	0	0	0	0	2.6
sum	100	100	100	100	100	100	100	100	100	100	100	100

Figure 3: Relative frequency of x for each y

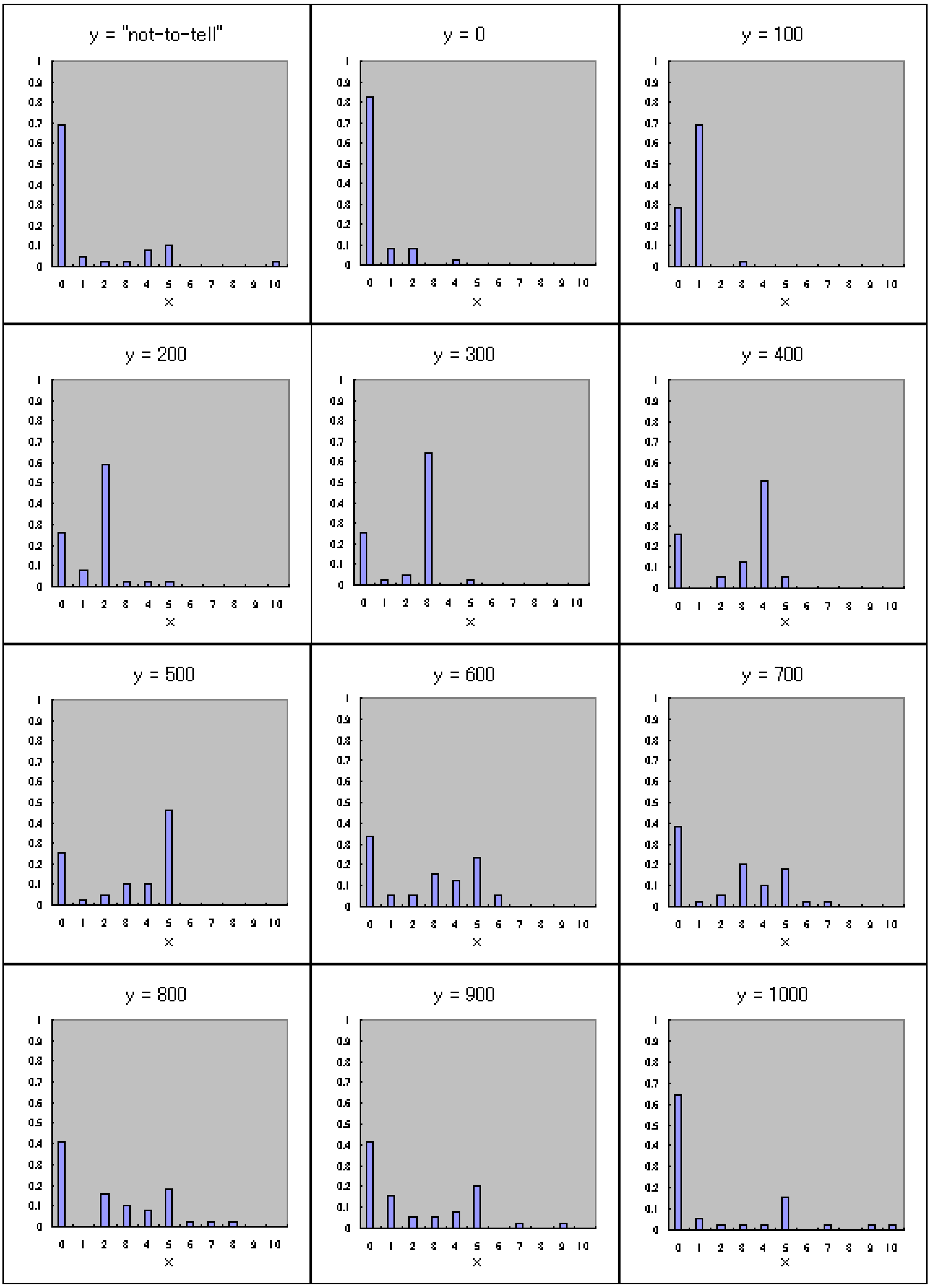


Table 2: Descriptive statistics of x												
y	not-to-tell	0	100	200	300	400	500	600	700	800	900	1000
minimum value	0	0	0	0	0	0	0	0	0	0	0	0
the first quartile	0	0	0	0	0	0	0	0	0	0	0	0
median	0	0	100	200	300	400	400	300	300	200	100	0
the third quatile	200	0	100	200	300	400	500	500	400	500	500	400
maximum value	1000	400	300	500	500	500	500	600	700	800	900	1000
mode	0	0	100	200	300	400	500	0	0	0	0	0

Figure 4: A box plot of dictators' choices for each y

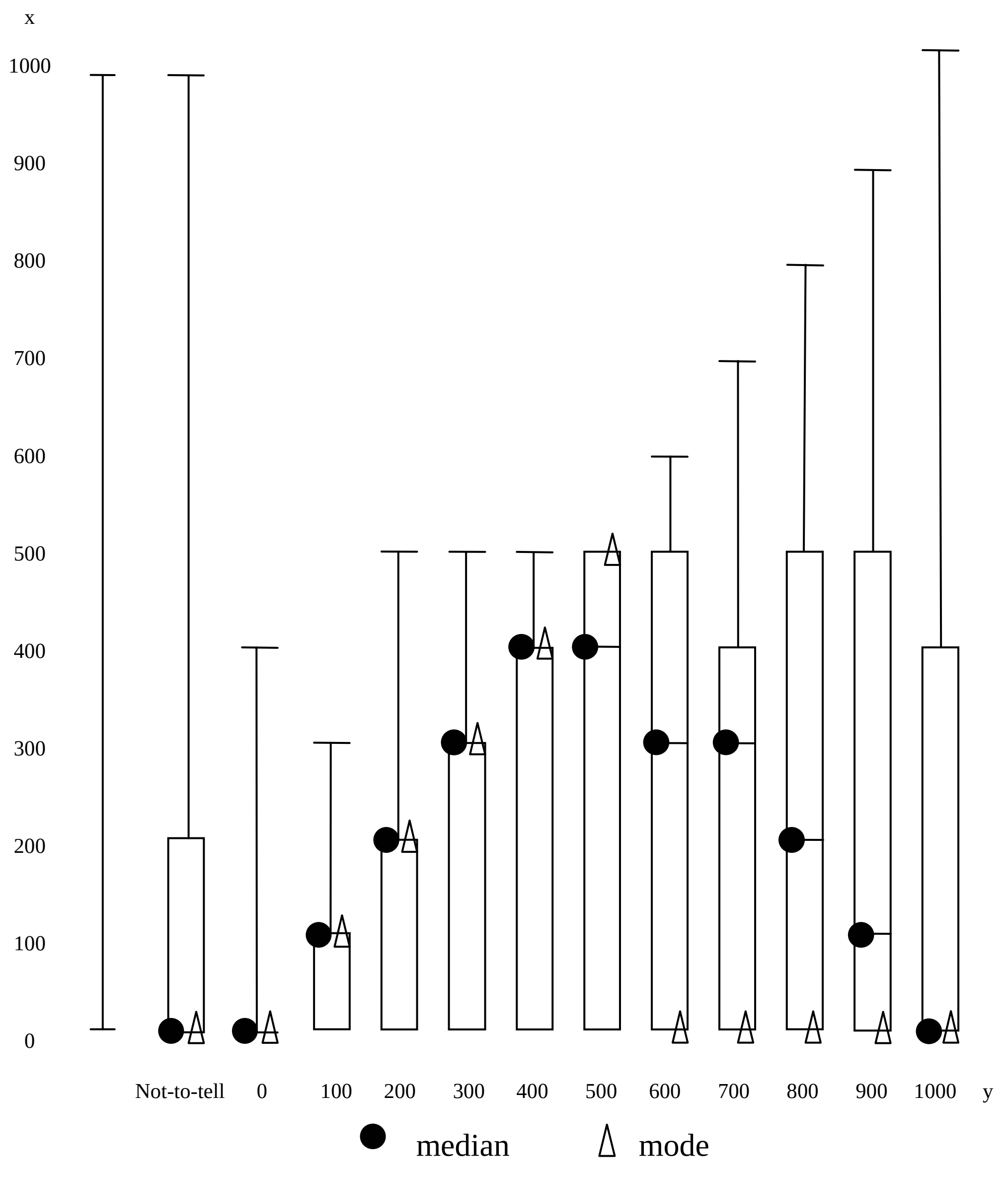


Table 3: Multiple comparison

no-tell											
47.5	0										
4	43.5	1									
44	91.5*	48	2								
85.5	133**	89.5*	41.5	3							
125**	172.5**	129**	81	39.5	4						
151.5**	199**	155.5**	107.5**	66	26.5	5					
123.5**	171**	127.5**	79.5	38	1.5	28	6				
100.5**	148**	104.5**	56.5	15	24.5	51	23	7			
91*	138.5**	95*	47	5.5	34	60.5	32.5	9.5	8		
76	123.5**	80	32	9.5	49	75.5	47.5	24.5	15	9	
34.5	82	38.5	9.5	51	90.5*	117**	89	66	56.5	41.5	10

** 1% $\geq z_{0.01/121}\sqrt{2}\sigma = 100.3$

* 5% $\geq z_{0.01/121}\sqrt{2}\sigma = 89.2$

Figure 5: Cluster analysis using the Ward's method

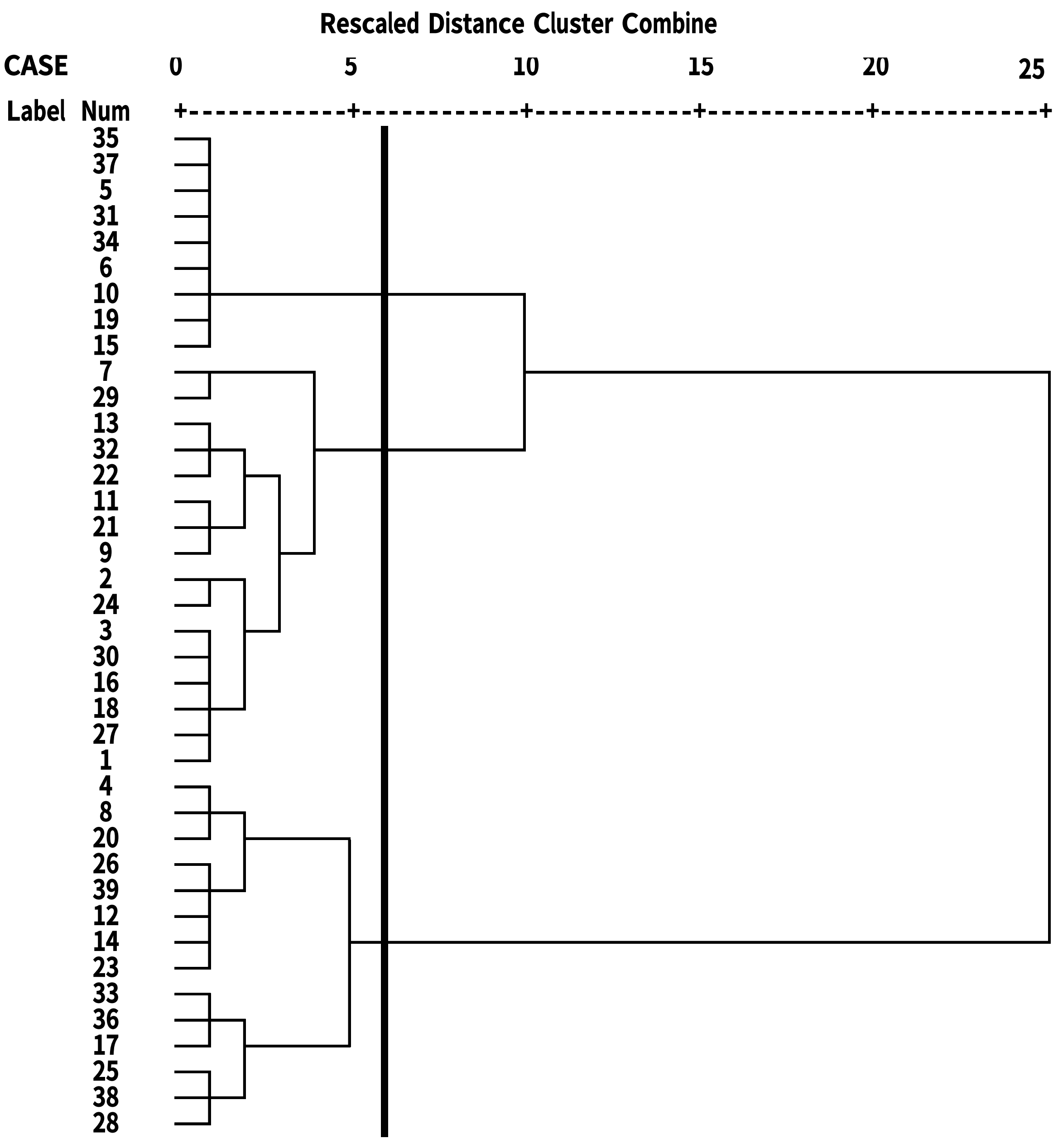


Table 4: Descriptive statistics of x (the first cluster)

y	not-to-tell	0	100	200	300	400	500	600	700	800	900	1000
minimum value	0	0	0	0	0	0	0	0	0	0	0	0
the first quartile	0	0	0	0	0	0	0	0	0	0	0	0
median	0	0	0	0	0	0	0	0	0	0	0	0
the third quatile	0	0	0	0	0	0	0	0	0	0	0	0
maximum value	0	100	100	100	0	0	0	0	0	0	0	0

Figure 6: A box plot of dictators' choices for each y (the first cluster)

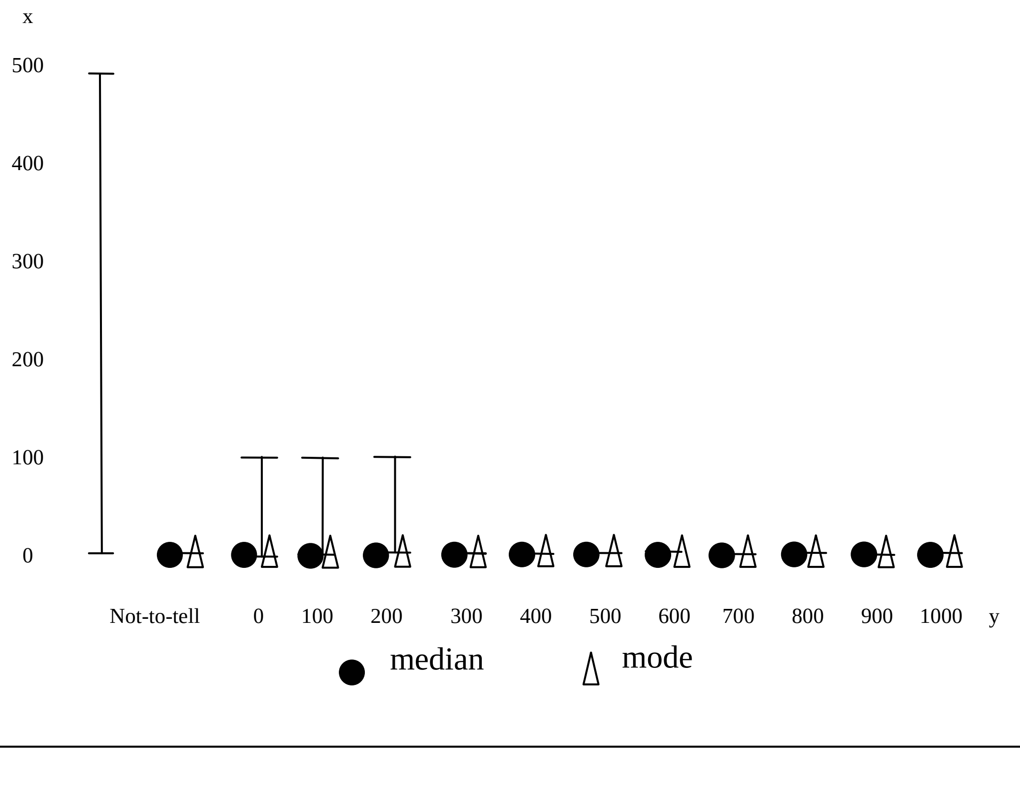


Table 5: Descriptive statistics of x (the second cluster)												
y	not-to-tell	0	100	200	300	400	500	600	700	800	900	1000
minimum value	0	0	0	100	200	200	200	300	200	300	300	0
the first quartile	0	0	100	200	300	400	400	400	400	400	400	300
median	50	0	100	200	300	400	500	500	500	500	500	500
the third quatile	400	100	100	200	300	400	500	500	500	500	500	500
maximum value	500	200	300	400	300	500	500	600	700	800	900	1000
mode	0	0	100	400	300	400	500	500	500	500	500	500

Figure 7: A box plot of dictators' choices for each y (the second cluster)

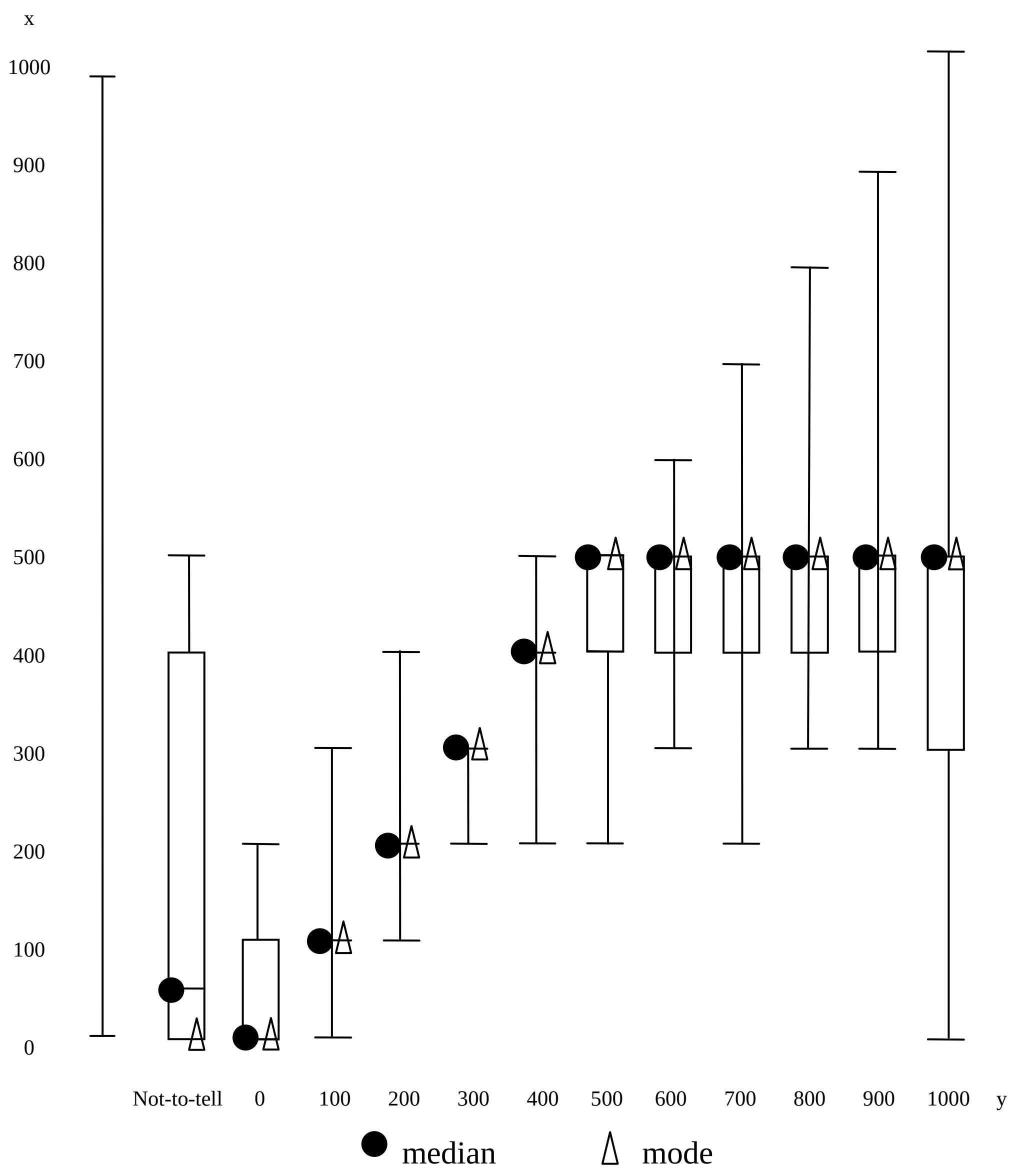


Table 6: Descriptive statistics of x (the third cluster)												
y	not-to-tell	0	100	200	300	400	500	600	700	800	900	1000
minimum value	0	0	0	0	0	0	0	0	0	0	0	0
the first quartile	0	0	100	200	300	300	300	100	0	0	0	0
median	0	0	100	200	300	400	500	250	250	200	100	0
the third quatile	250	0	100	200	300	400	500	350	300	200	100	0
maximum value	1000	400	100	500	500	500	500	500	400	300	300	200
mode	0	0	100	200	300	400	500	0, 300	0, 300	0	0	0

Figure 8: A box plot of dictators' choices for each y (the third cluster)

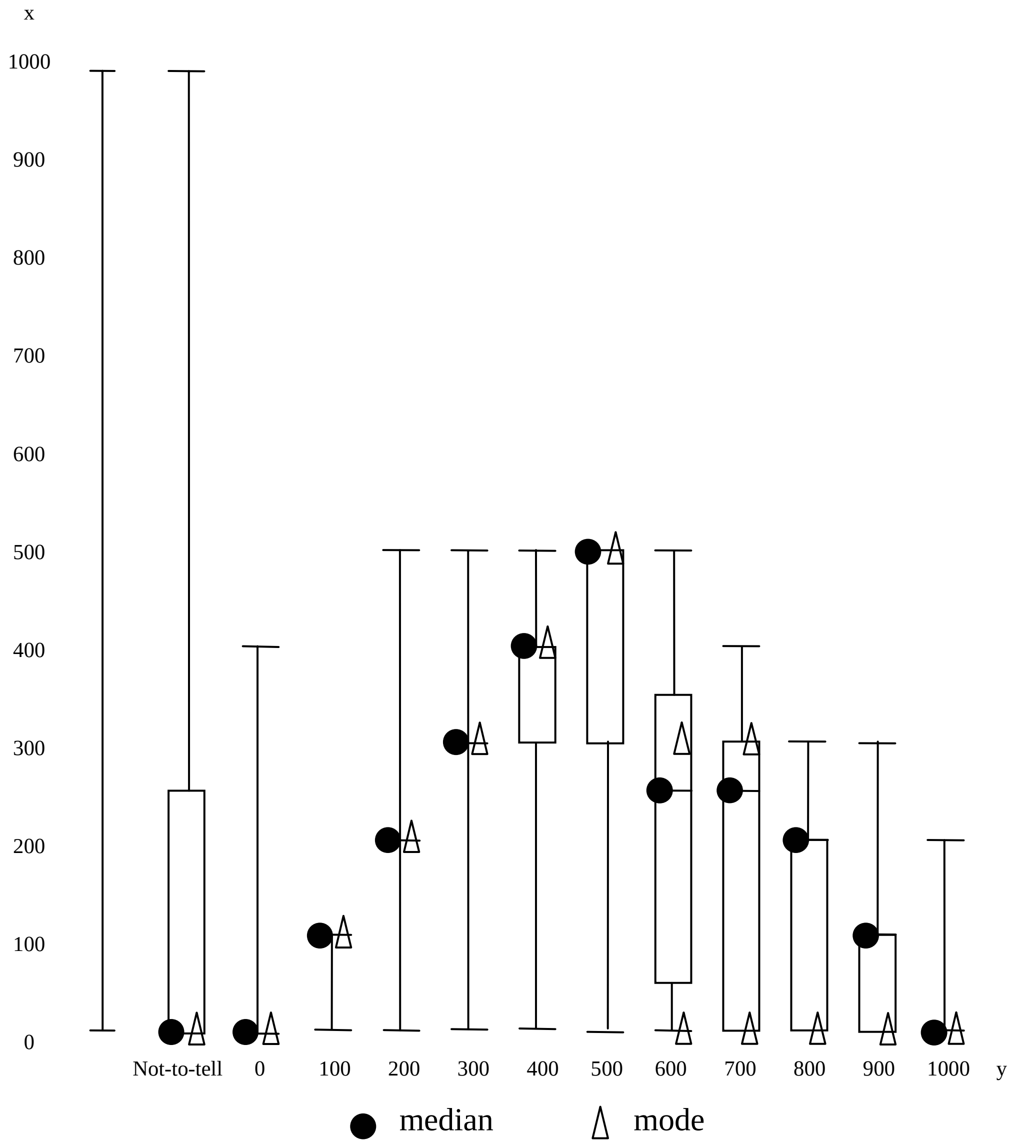


Figure 9: The distribution of relative frequency of recipients' choices

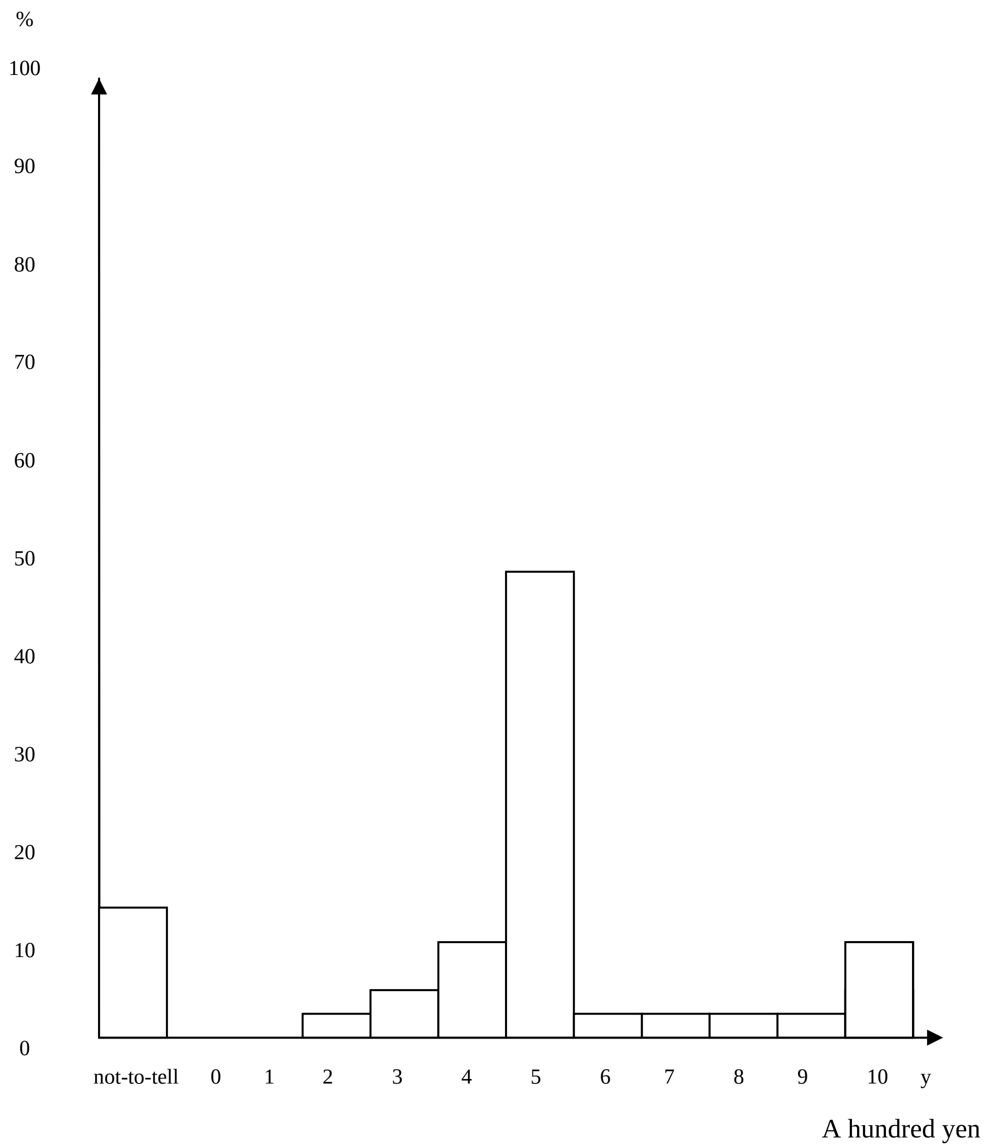


Table 7: Descriptive statistics of a recipient's acquired surplus

minimum value	0
the first quartile	0
median	300
the third quatile	500
maximum value	500

Appendix 1.

The instructions

The decision problem in the experiment you participate is very simple. If you carefully read and follow the instructions, the amounts of money you will earn in the experiment are directly paid in cash after the experiment is over.

Cautions

Do not talk to anyone and any eye contact is forbidden. If you do such things, we will demand you exit from the experiment. If you have any question, please raise your hand quietly. The instructors explain anything you ask. Do not exit from this room during the experiment. Turn off your beep phone.

The player whose identification number is odds is called player A and the other, that is, the player whose identification number is even, is called player B.

Check the contents in your envelope

Your will find the following materials in your envelope. Please check whether or not you have all of these in your envelope. If you don't have any of them, please let us know by raising your hand quietly.

(1) The instructions (this copy)

(2) A recording sheet

(3) Practice problems and an answer sheet

General instructions

Each pair is consisted with two players, player A and B, and the membership in your pair has been determined by us before the experiment. 1,000yen is allotted to each pair as a total reward for both players. Each player in the pair decides how to share that money according to the following rules. First player B is given 1,000yen from the instructors. Player A can ask player B at least how much he/she is willing to accept. The amount player A asks is called the minimum acceptable offer (MAO). Then player B decides the amounts, x, he/she is willing to give to player A. This is the end of experiment and player A receives x and player B 1,000-x yen respectively as their rewards.

Every subject participates in the experiment in the same room (Room 742). Don't exit from the room during the experiment. Next we will tell you more details of experimental procedures.

Experimental procedures

0. First of all, we would like you to solve practice problems. These are easy test to confirm your understanding of the game you will play. The time for solving them is three minutes. After that, the instructors will gather your answer sheet.

1. Please confirm the identification numbers for you and your opponent printed on the top of your recording sheet.

2. Player A and B do the following tasks simultaneously within four minutes when the experiment starts.

Player A: Mark “to tell” in the first column if you would like to tell your MAO to player B and mark “not to tell” if you would not. Then mark one of any 100s from 0 to 1,000 yen in the second column when you have marked “to tell” in the first column.

Player B: Mark any one of 100s from 0 to 1,000 yen for all possible amounts that player A can choose.

3. Please put all the experimental materials but the identification number into your envelope of A4 size after your decision-making is done.

4. The instructors gather your envelope of A4 size from you. This is the end of the experiment.

<u>Your reward</u>

After your decision-making is done, the instructors determine the outcome of the game for each pair. Please note the following things.

(1) The amounts you earned in the experiment do not affect your grade in this class.

(2) Practice problems are used to confirm your understandings of the rule of game you play. The score do not affect your grade in this class. But you will be not paid if you leave any of questions unanswered.

(3) You will also not paid if you do not write your recording sheet properly as the instructions explain. For example, marking twice in the same column, no marking, etc. Of course, your grade is not affected by such

mistakes. Note also that you will receive as much reward as you can if your opponent does not write recording sheet properly.

(4) The name of your opponent is never informed to you, even after the experiment.

Appendix 2.

Recording Sheet

Recording Sheet A

(You)

Player A's identification number ______________________ Player B's identification number ______________________

Your pair (player B) decides how to share 1,000 yen between you and himself/herself.
You can ask player B at least how much you are willing to accept.
Decide whether you tell MAO to player B or not.
(Mark **one** of the following alternatives.)

to tell	not to tell

<2>

Decide MAO **when you have marked "to tell" in the first column.**
(Mark **one** of the following amounts.)

(a hundred yen)

0	1	2	3	4	5

6	7	8	9	10

warning) You will not paid if you mark more than one.

Recording Sheet B

(You)

Player B's identification number ________________ Player A's identification number ________________

You are given 1,000yen from the instructors.
Decide the amount that you are willing to give to your pair (player A) for all possible his/her MAO.
(Mark one of the amounts for each case.)
If you decide to give **y** yen to him/her, then you receive (**1000-y**) yen and player **A** receives **y** yen.

---

cutoff line

<**1**>Mark one of the following amounts that you are willing to give player A, when he/she chooses "not to tell"

(a hundred yen)

0	1	2	3	4	5	6	7	8	9	10

warning) You will not paid if you mark more than one.

---

cutoff line

<**2**>Mark one of the following amounts that you are willing to give player A, when he/she chooses 100 yen.

(a hundred yen)

0	1	2	3	4	5	6	7	8	9	10

warning) You will not paid if you mark more than one.

●
●
●

---

cutoff line

<**9**>Mark one of the following amounts that you are willing to give player A, when he/she chooses 900 yen.

(a hundred yen)

0	1	2	3	4	5	6	7	8	9	10

warning) You will not paid if you mark more than one.

---

cutoff line

<**10**>Mark one of the following amounts that you are willing to give player A, when he/she chooses 1000 yen.

(a hundred yen)

0	1	2	3	4	5	6	7	8	9	10

warning) You will not paid if you mark more than one.

---

cutoff line

Appendix 3.

Raw data

Recipient		Dictator												
ID number	MAO	ID number	not-to-tell	0	100	200	300	400	500	600	700	800	900	1000
1	500	1	0	0	0	500	500	500	500	300	300	300	100	0
2	500	2	400	400	100	200	300	400	400	400	400	200	200	200
3	not-to-tell	3	0	0	100	200	300	300	300	300	300	200	100	0
4	500	4	0	0	100	200	300	400	500	500	500	400	400	0
5	1000	5	0	0	0	0	0	0	0	0	0	0	0	0
6	400	6	0	0	0	0	0	0	0	0	0	0	0	0
7	500	7	1000	0	100	200	300	400	500	0	0	0	0	0
8	900	8	0	0	100	200	300	400	500	500	500	500	500	0
9	not-to-tell	9	0	0	100	200	300	400	0	100	200	300	300	0
10	500	10	0	0	0	0	0	0	0	0	0	0	0	0
11	200	11	0	0	100	200	300	400	200	0	0	0	0	0
12	500	12	0	0	100	200	300	400	400	400	400	400	400	400
13	500	13	0	0	0	0	100	300	500	200	0	0	0	0
14	500	14	100	100	100	200	300	300	300	300	300	300	300	300
15	300	15	0	100	100	100	0	0	0	0	0	0	0	0
16	500	16	100	100	100	200	300	300	400	300	300	200	100	0
17	not-to-tell	17	400	0	100	200	300	400	500	500	500	500	500	500
18	1000	18	0	0	100	200	300	400	500	400	300	200	100	0
19	500	19	0	0	100	0	0	0	0	0	0	0	0	0
20	1000	20	0	0	100	100	200	300	400	400	400	500	500	100
21	500	21	0	0	100	200	300	200	100	100	0	0	0	0
22	700	22	0	0	0	0	0	0	500	0	0	0	0	0
23	not-to-tell	23	0	0	0	100	200	200	200	300	300	400	400	500
24	1000	24	500	0	100	200	300	400	500	500	300	200	100	0
25	500	25	400	200	300	300	300	400	500	600	700	800	900	900
26	500	26	0	0	100	200	300	400	500	500	500	500	500	500
27	400	27	0	0	100	200	300	400	500	500	400	300	200	100
28	400	28	300	200	100	400	300	500	300	400	200	600	500	1000
29	500	29	500	0	100	200	300	400	500	0	0	0	0	0
30	500	30	0	0	100	200	300	400	300	300	300	200	100	0
31	800	31	0	0	0	0	0	0	0	0	0	0	0	0
32	not-to-tell	32	0	0	100	200	300	400	500	200	100	0	0	0
33	500	33	500	0	100	200	300	400	500	500	500	500	500	500
34	500	34	0	0	0	0	0	0	0	0	0	0	0	0
35	300	35	0	0	0	0	0	0	0	0	0	0	0	0
36	500	36	500	0	100	200	300	400	500	500	500	500	500	500
37	400	37	0	0	0	0	0	0	0	0	0	0	0	0
38	600	38	200	200	100	200	300	400	500	500	600	700	700	700
39	500	39	0	0	100	200	300	400	500	600	500	500	500	500