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| Title            | Even Unreliable Information Disclosure Makes People Cooperate in a Social Dilemma : Development of the “Industrial Waste Illegal Dumping Game” |
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| Description      | ISAGA/JASAG2015 the 46th ISAGA conference   Japan Association of Simulation & Gaming hosts 17-21 July 2015 Kyoto, Japan post proceedingsへの掲載予定 |
| Relation         | ISAGA/JASAG2015 the 46th ISAGA conference   Japan Association of Simulation & Gaming hosts 17-21 July 2015 Kyoto, Japan                        |
| Citation         | Proceedings of The 46th International Simulation & Gaming Association Annual Conference, 491-506                                               |
| Issue Date       | 2015-06                                                                                                                                        |
| Doc URL          | <a href="https://hdl.handle.net/2115/62394">https://hdl.handle.net/2115/62394</a>                                                              |
| Type             | conference paper                                                                                                                               |
| File Information | 150626ISAGA2015manuscript(kitakaji)final.pdf                                                                                                   |



# Even Unreliable Information Disclosure Makes People Cooperate in a Social Dilemma:

## Development of the “Industrial Waste Illegal Dumping Game”

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**Abstract**□□ This study explores whether information disclosure can cause cooperation in a social dilemma, even when people can disseminate false information. In the past, illegal dumping increased in Japan despite the strengthening of penalties and surveillance laws, due to practical limitations in monitoring and surveillance. To resolve this, the tracking sheet used to trace the trading and processing of the wastes must be traceable in order to detect illegal dumping. This means that manifests must be written precisely in order to be effective but if maintaining a tracking log has some function other than surveillance this may not be the case. To examine this issue we used the “Industrial Waste Illegal Dumping game” (Ohnuma & Kitakaji, 2007) which simulates the disposal of industrial waste and is structured as a social dilemma with asymmetry of information. In this study we utilised two conditions: a disclosure and a control condition. Under the disclosure condition, players had to enter the amount of commission or disposal in the landfill but did not have to fill in the correct amount. Although players could read the report, they could not know who performed illegal dumping or how much they contributed. Therefore, this disclosure did not have an effective surveillance function and could not help detect non-cooperation. However, the results showed that the amount of illegal dumping was reduced, and information on payoffs was shared more in the disclosure condition than in the control condition. Moreover, players collected and shared their information more in the disclosure condition than in the control condition. The study thus indicates that the function of disclosure is not surveillance, but information sharing which is essential for voluntary cooperation.

*Keywords: social dilemma, industrial waste, illegal dumping, monitor, information disclosure*

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## 1 Purpose

The purpose of this study was to demonstrate that information disclosure causes cooperation in a social dilemma, even if people can disseminate the false information. We used the “Industrial Waste Illegal Dumping Game” (Ohnuma & Kitakaji, 2007), which simulated the disposal industry in Japan. The goal of the research is to consider the function of disclosure not only as surveillance but also as information sharing.

### *1.1 Illegal dumping and disposal systems of industrial wastes in Japan from the social dilemma perspective*

400 million tons of industrial waste were generated per year in the latest several years and approximately 40-50 thousand tons of industrial waste were illegally dumped in Japan. (Japanese Ministry of the Environment, 2014). However, the amount of illegal dumping was unknown because the statistics included only discovered amounts, and it is impossible to discover all cases of illegal dumping. It is estimated that far greater amounts of illegal dumping exists. Indeed, 560 thousand tons of illegal dumping were discovered ten years ago. In addition, some industrial wastes have grave impacts on the surrounding environment, and restoring environments damaged by illegal dumping is time consuming and expensive. The costs for restoration are incurred by the dumper if it is clear who is responsible, but if it is not clear or if the dumper has insufficient assets to incur the cost the government incurs the cost and restores the environment, which means that the costs are covered by public funds such as the tax. Recently, an organization of industries has established a fund for restoring sites polluted by illegal dumping. Accordingly, whole industries assume some costs for restoration, which makes industries assume responsibility for illegal dumping by themselves.

In this research, we view the illegal dumping problem as a social dilemma. A social dilemma is defined by two properties: (a) Each individual receives a higher payoff for a socially defecting choice than for a socially cooperative choice, no matter what the other individuals in the society do, but (b) all individuals are better off if all cooperate than if all defect (Dawes, 1980; Pruitt & Kimmel, 1977). Considering the case of illegal dumping, we can think of appropriate disposal as cooperation and illegal dumping as defection. If each one disposes appropriately, they would preserve the surrounding environment, but if all of them disposed illegally, they would damage their surrounding environment bringing about large restoration costs, which would come back to themselves. As noted above, industrial waste disposal systems make industries cover the costs of illegal dumping. That is to say, industries systematically produced a social dilemma structure.

A major resolution of a social dilemma problem is structural change to change the payoffs. Examples of such structural change are monitoring and punishment. Many previous studies have shown that sanctions such as monitoring or punishment have caused cooperation (Caldwell, 1976; Van Vugt & De Cremer, 1999; Wit & Wilke, 1990; Yamagishi, 1986, 1992). However, sanctions do not work without discovering illegal dumping. In fact, it is hard to discover illegal dumping for real. Though strict punishment already exists for illegal dumping in Japan, strengthening the surveillance failed to increase detecting illegal dumping, instead, strict surveillance resulted in concealment of illegal dumping (Ishiwata, 2002). Therefore, measures other than monitoring and punishment are required to resolve the illegal dumping problem. Goal expectation theory (Pruitt & Kimmel, 1977; Yamagishi, 1986) emphasizes the expectation of mutual cooperation, that is, a) one can perceive the situation to seek not personal benefit but public benefit, and b) one can expect others not to choose to defect but to choose to cooperate. One key factor for promoting mutual expectation is information sharing, particularly when other players' payoffs are uncertain. This study demonstrated the importance of information sharing obtained through information disclosure.

## ***1.2 Studying social dilemma using simulation and gaming***

Theoretical and experimental research in social dilemmas have been studied and accumulated, while studies using gaming methods have been developed. For example, SIMINSOC (Hirose, 1997) based on Gamson's SIMSOC (1978), and The Industrial Waste Game (Hirose, Sugiura, and Shimomoto, 2004) based on Garbage (Thiagarajan, 1991) simulate interactions among players in a social dilemma situation. In these games, players communicate with each other, create situations involving bargaining for themselves, and make decisions to maximize their profit while depending on each other.

Shubik (1965) positioned gaming as a kind of antithesis to experimentation. He argued that experimental games pared away many factors from reality because they are demanded theoretical clarity and precision, and to generalize differences in phenomena. On the other hand, gaming weighs interaction among participants rather than constructing sophisticated theories; so gaming allows to observe a process of group dynamics in which participants affect each other and the interactions create a social situation (Shubik, 1965). Hirose (2000) noted that one remarkable feature of gaming is "reality": Participants felt that their gaming experiences could occur for real. Furthermore, gaming simulation allows participants to join the process of creating a society, in which consequences can vary according to their interactions even though the initial setting was given (Hirose, 2000). This feature of gaming is important for research in social dilemmas, because the consequences of a social dilemma depend on members' interaction. Therefore, many studies on social dilemmas have focused on the effects of discussion. Some of them showed that discussion

focused on cooperation is necessary for mutual cooperation, but discussion focused on non-cooperation was failed (Deutsch, 1958; Deutsch, Epstein, Canavan, & Gumpert, 1967). The other study showed that further cooperation was observed when participants promised cooperation than when they participated in discussion only, even though the promise have no binding force and they could violate the promise (Orbell, Van de Kragt, & Dawes, 1988). Furthermore, Ostrom (1990) discovered that dialogue prevents the tragedy of the commons in actual societies. These findings indicated that dialogue among members is essential for resolving a social dilemma.

Gaming has another advantage. It acts as “a tool for discovering problems” (Armstrong & Hobson, 1973). Duke and Geurts (2004), citing Armstrong and Hobson (1973), argued that gaming allows us to invent the future when we reflect on a problem in an intuitive and uncalibrated way. Gaming simulation allows us to understand the complex dynamics in giving back to a society. This study tackled a problem that was merely noted in social dilemmas research: The function of information disclosure is not only monitoring but sharing goals and encouraging expectations of mutual cooperation.

## 2 Design of the Gaming

### 2.1 The structure of the “Industrial Waste Illegal Dumping Game”

We have developed the “Industrial Waste Illegal Dumping Game,” which simulates a social dilemma structure. It has six given structures indispensable for examining the illegal dumping problem: a) social dilemma structure, b) different roles, c) different payoffs and initial information by roles, d) one-way flow of wastes, e) difficulty of monitoring, and f) a time lag in the consequence of illegal dumping.

a) *Social dilemma structure*. Players in the game make decisions to appropriately dispose waste (cooperation) or to illegally dump it (non-cooperation). For individuals, it is more profitable to dump illegally than to dispose appropriately; however, if all players dumped illegally the total social profit would be less than that if all players disposed appropriately. b) *Different roles*. There are three different roles in the game: producing industry, intermediate treatment industry, and terminal industry. Each industry has specific work and is required to do its own work to appropriately dispose industrial waste. In particular, producing industries generated money and wastes as a by-product of production. Producing industries negotiate with intermediate treatment industries, contract out waste treatment to them paying them a commission because the producing industries cannot dispose waste appropriately by themselves. The intermediate treatment industries can reduce waste, negotiated with terminal industries and contract out waste treatment to them by paying them.

The terminal industries reclaim waste in landfills. c) *Different payoffs and initial information by roles*. Their payoffs and initial information differed by roles because each has a different mission from the others in appropriate disposal. Costs for appropriate disposal are specific to each industry, and different industries do not know the other costs for appropriate disposal. For example, it takes costs to produce, reduce waste, and reclaim in landfill, but players do not know how much about the other types of players. d) *One-way flow of wastes*. As noted above, producing industries have to contract out waste treatment to intermediate treatment industries, and intermediate treatment industries have to contract out to terminal industries. This flow is fixed and the waste cannot go backwards. e) *A time lag in the consequence of illegal dumping*. Players can dump illegally whenever and wherever they want to without conforming to the flow. If someone dumped illegally no one would know who was responsible nor how much was illegally dumped. The amount of illegal dumping is announced at the end of the game, and then players pay money for restoration of the environment damaged by illegal dumping.

## ***2.2 Rules of the Industrial Waste Illegal Dumping Game***

All players in this game are asked to maximize their own benefit. Every player can choose to be cooperative by disposing wastes appropriately (C) or to be non-cooperative by dumping wastes illegally (D), though not the choice between one of the two but a continuous function, and non zero sum that is, players can dispose some of wastes appropriately and can dump the rest of wastes illegally. Players each assumed one of three roles with more than two players in each of the roles: producing industries, intermediate treatment industries, and terminal industries. They each have different roles in appropriate disposal.

For appropriate disposal, every player has to determine the amount of waste to dispose appropriately, make a contract, and pay a commission in face-to-face negotiation. They do not know the payoffs of any other type of player at the beginning of the game (Figure 1). Any player can communicate with any of the others, but players bargained only with limited types of players. That is, producing industries cannot contract out waste management terminal industries directly.

Players can also illegally dump waste (Figure 2). Any type of player can choose illegal dumping as non-cooperation. If players wanted to dump illegally, they simply put card-shaped-wastes into one of the “illegal dumping boxes” (Figure 3) distributed everywhere in the site.

Nobody knows how much waste are dumped and who have performed illegal dumping, even if someone witnessed a player dumping illegally.

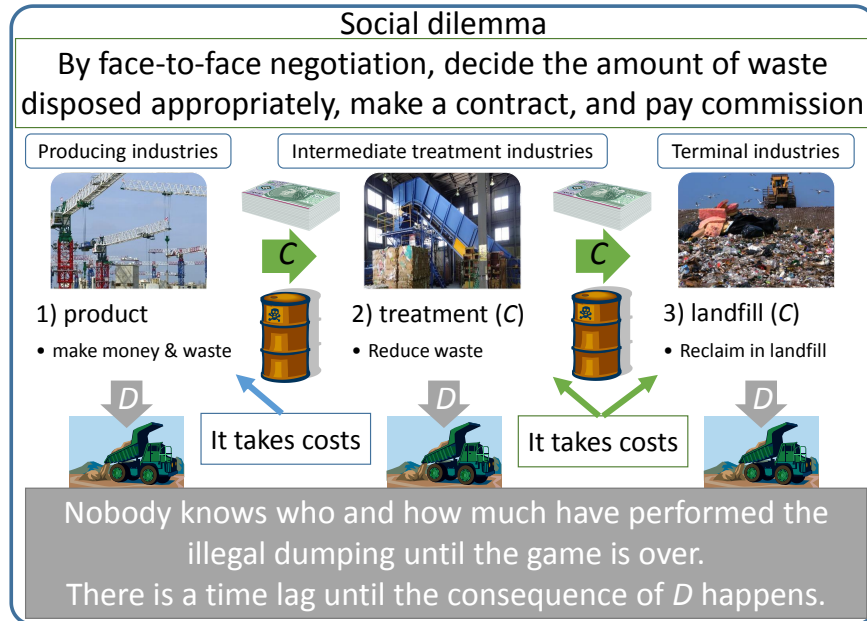


Figure 1. Flow chart of industrial waste disposal in the game. Cooperative behavior is shown as C and non-cooperative behavior is shown as D in the figure.



Figure 2. A player dumping illegally.

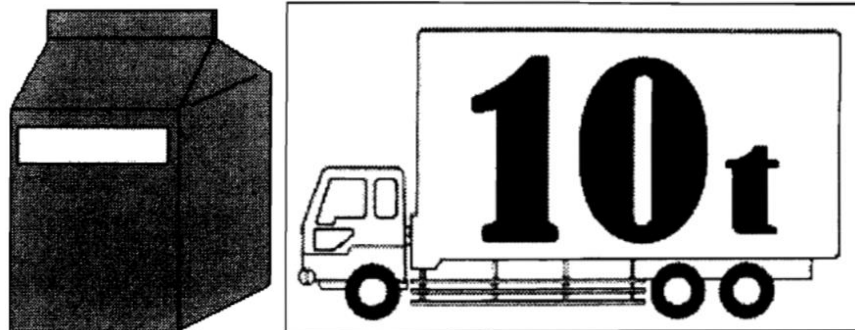


Figure 3. Tools for the Industrial Waste Illegal Dumping Game. Left, illegal dumping box; right, card-shaped-wastes.

There is also a time lag between illegal dumping and its consequences. As a consequence of non-cooperation, all players have to pay environmental restoration expenses according to the total amount of illegal dumping at the completion of all sessions.

Illegal dumping is more profitable than following the appropriate process for every individual in the short term, but the more the illegal dumping occurred the less the overall profit will be for all players. The players repeated this decision-making process. After the game end, the producing industries are fined more than other industries because they have to pay more for illegal dumping than other industries because of 'producer responsibility' for checking appropriate disposal industrial waste.

In addition, producing industries have to pay a fine if they could not submit tracking sheets. If a producing industry failed to obtain one of the first and second management sheets, he or she was penalized. The tracking sheet is proof that they had disposed waste appropriately. Players stamped the sheets if they had disposed waste appropriately. However, players who dump illegally can manipulate the first or second management sheets, and can stamp them even if they did not dispose waste appropriately, because no one could confirm their actions.

### ***2.3 The perspective of the research***

When contracting out waste treatment to other industries, it is necessary to pass tracking sheets to prove appropriate waste disposal. Each industry stamp and fill in its tracking sheets and returned them to the producing industries upon completion of waste disposal. The producing industries have to check the tracking sheets, which are returned if waste is disposed appropriately. If tracking sheets are not returned to the producing industry, the producing industry that failed to submit the tracking sheet pays a fine as producer responsibility. However, anyone can fake tracking

sheets. Indeed, the descriptions on 60% of tracking sheets are unreliable (Asaoka, Tanikawa, & Baba, 2012) for confirming actual appropriate disposal in Japan.

This study explored the function of the tracking sheet system. Given that the tracking sheets only have the function of monitoring to encourage cooperation, they are difficult to use effectively. However, if they had a different function from monitoring i.e. framing the situation as requiring mutual cooperation, they would work. Hence, this study examined the necessary condition by redesigning the tracking sheets system in the game.

### 3 Method

#### 3.1 Condition

The players' goal was to maximize self-profit and they were rewarded with snacks according to their final scores in the game.

We set two conditions, a control and a disclosure condition. We manipulated how the tracking sheets were checked. Under the disclosure condition, all the players had to fill in the amount of commission or landfill in the tracking sheets and pass them to the next industry by hand. If any blanks remained in the tracking sheet, the producing industries were penalized and paid a fine. However, they did not have to fill in the correct amount. There were no penalties for mistakes in the document. In the control condition, when producing industries or intermediate treatment industries passed industrial waste to the next industry, they only had to stamp tracking sheets. Players did not have to fill in the amounts of waste disposed. If any tracking sheets were not stamped, the producing industries had to pay penalties.

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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The 1<sup>st</sup> order tracking sheet</p> <p>_____session</p><br><p>Publishing producing industry      ID _____</p><br><div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 5px; text-align: center; width: 40%;"> <b>STAMP</b><br/> <small>Producing Industry</small> </div> <div style="border: 1px solid black; padding: 5px; text-align: center; width: 40%;"> <b>STAMP</b><br/> <small>Intermediate Treatment Industry</small> </div> </div> | <p>The 1<sup>st</sup> order tracking sheet</p> <p>_____session</p> <p>Publishing producing industry      ID _____</p> <p>To intermediate treatment industry</p> <p>The amount of commission      _____t</p><br><div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 5px; text-align: center; width: 40%;"> <b>STAMP</b><br/> <small>Producing Industry</small> </div> <div style="border: 1px solid black; padding: 5px; text-align: center; width: 40%;"> <b>STAMP</b><br/> <small>Intermediate Treatment Industry</small> </div> </div> |
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Figure 4. Examples of tracking sheets. Left, a tracking sheet in the control condition; right, a tracking sheet in the disclosure condition. There was a blank for a stamp only in tracking sheets in the control condition, and there were blanks for both a stamp and the amount of commission in the disclosure condition.

### 3.2 Participants

We conducted six games in total: three games each for the control and the disclosure conditions. Fifty-six students participated in the study, with 9–12 participants in each game and more than 3 of each type of player.

After general instructions, players were assigned roles by lottery. They were then instructed on the specific rules of each industry. Finally, a practice session and 5 game sessions were conducted.

### 3.3 Dependent variables

We measured the observed amount of illegal dumping and the postgame questionnaire.

**The amount of illegal dumping.** To assess cooperation, we compared the amount of illegal dumping per person between conditions. After all sessions were completed, we calculated the amount of illegal dumping. No player knew the amount of illegal dumping until the game was over.

**Questionnaire.** After the game ended, players answered a questionnaire about the degree of shared information, disclosure of information, collection of information, honesty on tracking sheets, effects of information disclosure, cooperation with the same/other industries, and attitude in the game. Participants answered the items except for the items of the degree of shared information on a 7-point scale, from 1 (I do not think so at all) to 7 (I very strongly believe so) to describe their feelings after the game. The contents of the questionnaire were as follows.

*The degree of shared information.* Players answered when they knew other players' payoffs. They chose from the following options: practice session, 1-5 session, or did not know until the end of the game. We labeled their responses as "knew" and "didn't know" in our analysis. We eliminated responses on the payoffs within the same industry and analyzed the remaining findings with a chi-square test. The reason why we eliminated responses on the payoffs within the same industry is because players know the payoff of the same type of industry with their own type.

*Collecting information.* We measured how players tried to collect information. Players rated 5 items such as "Other players provided information about bargaining or payoffs" and "I collected information about bargaining or payoffs of product (intermediate treatment, or terminal) industries." ( $\alpha = .74$ ).

*Disclosing information.* We asked if players disclosed their information about payoffs or bargaining with 5 items such as "I provided information about bargaining or payoffs" and "I gave out information about bargaining or payoffs." ( $\alpha = .47$ )

*Honesty on tracking sheets.* To assess dealing with tracking sheets, we presented 2 items: “I reported on tracking sheets honestly and I stamped them” and “I felt a sense of obligation to report on tracking sheets honestly and I stamped them.”

*Effectiveness of information disclosure.* To assess the effectiveness of tracking sheets, we presented 2 items: “Disclosing information about bargaining or payoffs benefitted me” and “Writing down the amount of commission facilitated our communication with each other.”

*Cooperation with the same/other industries.* We asked if players cooperated with the same/other industry player. Cooperation with the same industry consist of 2 items: “I collaborated with players in the same industry” and “I cooperated with players in the same industry” ( $\alpha = .98$ ). Cooperation with the other industry consist of 2 items: “I collaborated with players in other industries” and “I cooperated with players in other industries” ( $\alpha = .93$ ).

*Attitude in the game.* To assess attitude in the game, we presented 2 items: “I acted in the game with concern for the environment” and “I acted in the game for money.”

### **3.4 Debriefing**

After administration of the questionnaire a debriefing session was held. Participants received snacks according to each individual’s total assets in the game. The facilitators asked for their impression of the game, their own roles and the other industries, what aspects they paid attention, and what the purpose of the game was. Further, to share each participant’s recognition, the facilitators talked about what was happening in the game and how the game proceeded. The facilitator also answered questions from the participants. Next, the situation of illegal dumping of industrial waste in Japan, the nature of a social dilemma problem, and the rules of industrial waste disposal in Japan were explained, followed by an explanation of the rules of the games associated with real-life rules. To facilitate deeper understanding of the game, we talked about how they negotiate with each other, what happened in the game or the costs of production, intermediate treatment, and reclaiming landfill contents. Finally, to moderate conflict, we emphasized that players’ behaviors were not always representative of their own personalities, but they were affected by the given structure including payoffs of the game and by other players’ behavior. The debriefing took 15–30 minutes. After finishing the debriefing, the players voluntarily reallocated their sweets to share them equally, without encouragement from the facilitator. This indicated that the debriefing successfully de-rolled the players and ended any residual conflict from the game.

## 4 Results

**The amount of illegal dumping.** To check differences between conditions or industries, a three-way analysis of variance (ANOVA: conditions  $\times$  industries  $\times$  sessions) by mixed model including a factor for game was conducted on a session within participants, and conditions and industries between participants. We analyzed the amount of illegal dumping. There was a significant main effect of condition, showing that cooperative behaviors were more likely in the disclosure condition ( $F(1, 200) = 3.05, p < .05$ ). A significant interaction was found between session and industries ( $F(1,200) = 4.60, p < .05$ ). The more the time elapsed, the more the producing and intermediate treatment industries decreased the amount of illegal dumping, while the terminal industries dumped more illegally. However, checking by condition, more was dumped illegally in the control condition. Moreover, only one player engaged in illegal dumping in the final session in the disclosure condition and this was caused by the rumor that he was dumping illegally. Upon hearing this rumor, he became angry and publically engaged in illegal dumping, despite not having dumped much illegally until then (Table 1).

**Table 1.** The amount of illegal dumping.

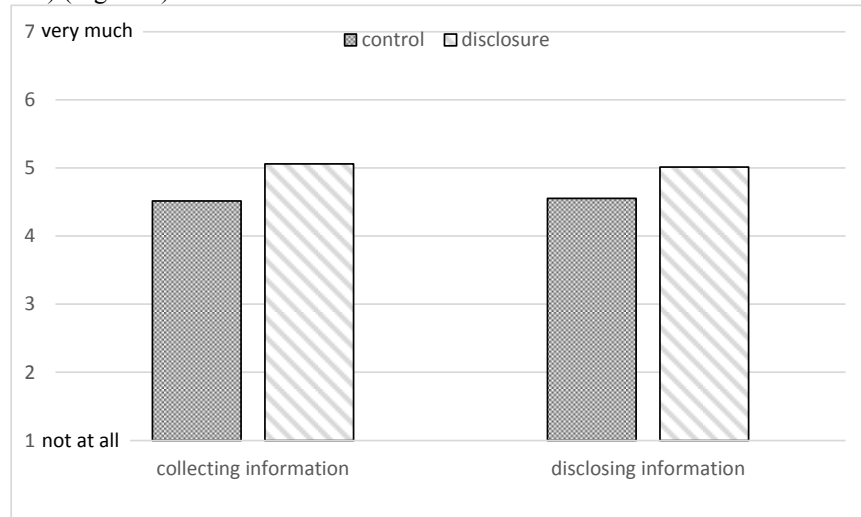
|                   |                        | Session1 |           | Session2 |           | Session3 |           | Session4 |           | Session5 |           | total    |           |
|-------------------|------------------------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
|                   |                        | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> |
| <b>Control</b>    | Producing              | 10.00    | 31.62     | 6.00     | 18.97     | 6.00     | 18.97     | 0.00     | 0.00      | 6.00     | 18.97     | 28.00    | 59.78     |
|                   | Intermediate treatment | 0.00     | 0.00      | 8.89     | 20.28     | 0.00     | 0.00      | 4.44     | 13.33     | 0.00     | 0.00      | 13.33    | 22.36     |
|                   | Terminal               | 0.00     | 0.00      | 0.00     | 0.00      | 7.78     | 23.33     | 8.89     | 17.64     | 13.33    | 33.17     | 30.00    | 36.06     |
|                   | Total                  | 3.57     | 18.90     | 5.00     | 15.99     | 4.64     | 17.10     | 4.29     | 12.60     | 6.43     | 21.81     | 23.93    | 42.19     |
| <b>Disclosure</b> | Producing              | 3.00     | 9.49      | 4.00     | 12.65     | 0.00     | 0.00      | 0.00     | 0.00      | 0.00     | 0.00      | 7.00     | 22.14     |
|                   | Intermediate treatment | 1.11     | 3.33      | 0.00     | 0.00      | 0.00     | 0.00      | 0.00     | 0.00      | 0.00     | 0.00      | 1.11     | 3.33      |
|                   | Terminal               | 0.56     | 1.67      | 0.00     | 0.00      | 1.11     | 3.33      | 0.00     | 0.00      | 5.56     | 16.67     | 7.22     | 16.41     |
|                   | Total                  | 1.61     | 5.94      | 1.43     | 7.56      | 0.36     | 1.89      | 0.00     | 0.00      | 1.79     | 9.45      | 5.18     | 15.96     |
| <b>All</b>        | Producing              | 6.50     | 23.00     | 5.00     | 15.73     | 3.00     | 13.42     | 0.00     | 0.00      | 3.00     | 13.42     | 17.50    | 45.18     |
|                   | Intermediate treatment | 0.56     | 2.36      | 4.44     | 14.64     | 0.00     | 0.00      | 2.22     | 9.43      | 0.00     | 0.00      | 7.22     | 16.74     |
|                   | Terminal               | 0.28     | 1.18      | 0.00     | 0.00      | 4.44     | 16.53     | 4.44     | 12.94     | 9.44     | 25.78     | 18.61    | 29.60     |
|                   | Total                  | 2.59     | 13.92     | 3.21     | 12.52     | 2.50     | 12.25     | 2.14     | 9.09      | 4.11     | 16.82     | 14.55    | 32.99     |

**Questionnaire.** *The rates of sharing payoff matrix about other industries; benefit of product, cost of intermediate treatment and landfill.* To compare the rates of the sharing payoffs between conditions, a chi-square test was conducted on the sharing rates of the payoffs of other industries. There was no significant difference in payoffs for product and intermediate treatment (product:  $\chi^2(1) = 0.45$ , n.s., intermediate treatment:  $\chi^2(1) = 1.15$ , n.s.), but there was a significant difference in the payoffs for landfill ( $\chi^2(1) = 9.47$ ,  $p < .01$ ). Players in the disclosure condition knew more about the payoffs for landfill than players in the control condition (Table 2).

**Table 2.** The rates of sharing payoff matrix about other industries.

| Condi-<br>tions |   | About producing |             | About intermediate treatment |             | About reclaiming in landfill |             |
|-----------------|---|-----------------|-------------|------------------------------|-------------|------------------------------|-------------|
|                 |   | Knew            | Didn't know | Knew                         | Didn't know | Knew                         | Didn't know |
| Control         | N | 9               | 9           | 12                           | 7           | 8                            | 11          |
|                 | % | 50.0%           | 50.0%       | 63.2%                        | 36.8%       | 42.1%                        | 57.9%       |
| Disclosure      | N | 11              | 7           | 15                           | 4           | 17                           | 2           |
|                 | % | 61.1%           | 38.9%       | 78.9%                        | 21.1%       | 89.5%                        | 10.5%       |

*Collecting and disclosing information.* We investigated whether players disclosed or collected information about bargaining and payoffs. There were marginally significant differences in information collection between conditions ( $F(1, 37) = 4.85$ ,  $p < .10$ ). In the disclosure condition, players collected more information. However, there was not a significant difference in disclosing information ( $F(1, 37) = 1.62$ , *n.s.*) (Figure 5).

**Figure 5.** The degree of collecting and disclosing information

*Honesty on tracking sheets.* We asked how the players reacted to tracking sheets. There were significant differences in both items, “I reported on the tracking sheets honestly and I stamped them” ( $F(1, 38) = 29.21$ ,  $p < .05$ ), “I felt a sense of obligation to report on tracking sheets honestly and I stamped them” ( $F(1, 38) = 11.28$ ,  $p < .05$ ). Players behaved more honestly on tracking sheets in the disclosure condition than in the control condition (Figure 6).

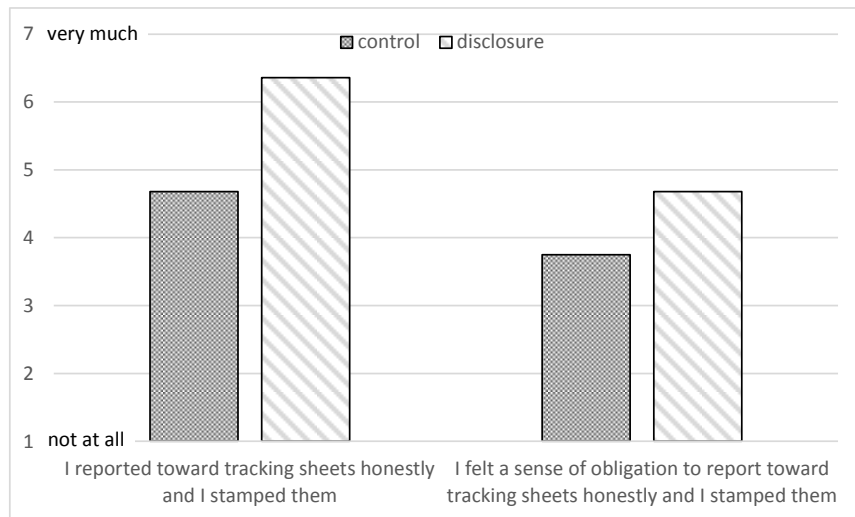


Figure 6. The degree of the honesty on tracking sheets

*The effectiveness of information disclosure.* We investigated whether players felt the information disclosure was effective. There were significant differences in both items, “I thought that disclosing information about bargaining or payoffs benefitted me” ( $F(1, 38) = 9.11, p < .05$ ) and “Writing down the amount of commission facilitated our communication with each other.” ( $F(1, 38) = 80.46, p < .001$ ). Under the disclosure condition, more players thought that the disclosure of information benefitted them and facilitated their communication with each other than in the control condition (Figure 7).

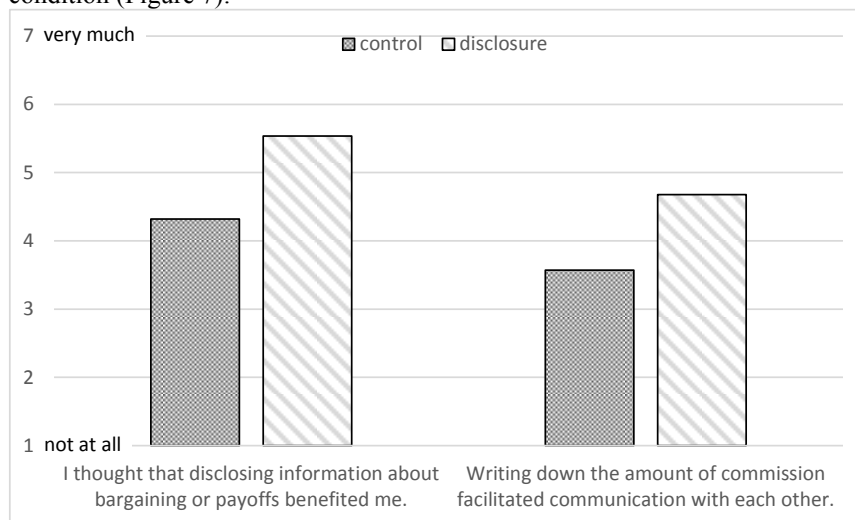


Figure 7. The effectiveness of information disclosure

*Cooperation with the same/other industries.* We investigated the degree of cooperation with the same/other industries. There was marginally significant difference in cooperation with the same industry ( $F(1, 38) = 6.23, p < .10$ ). However, there was not significant difference in cooperation with other industries ( $F(1, 37) = 2.93, n.s.$ ). Under the control condition, players cooperated more with others in the same industries than in the disclosure condition (Figure 8).

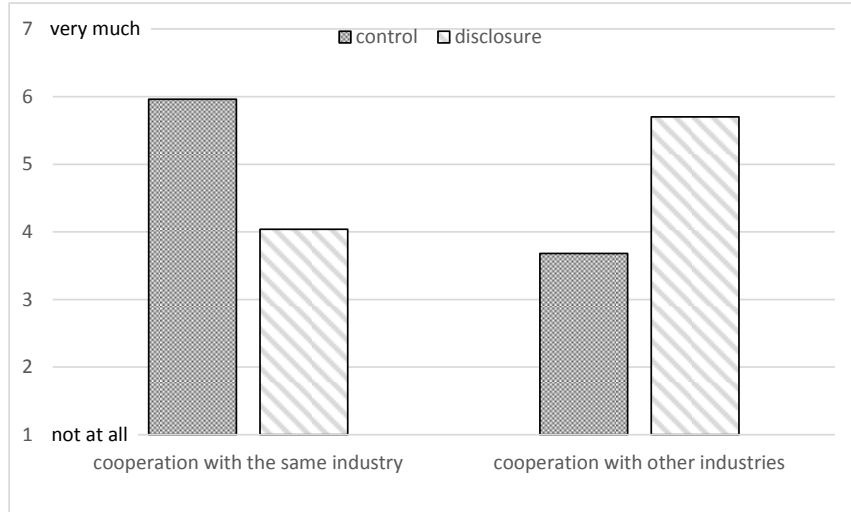


Figure 8. The degree of cooperation with the same/other industries

*Attitude in the game.* We investigated which factors players paid attention to. The results showed significant differences. Players in the disclosure condition answered that they paid more attention to the environment ( $F(1, 38) = 9.58, p < .05$ ) and those in the control condition reported they acted for money ( $F(1, 38) = 7.30, p < .10$ ) (Figure 9).

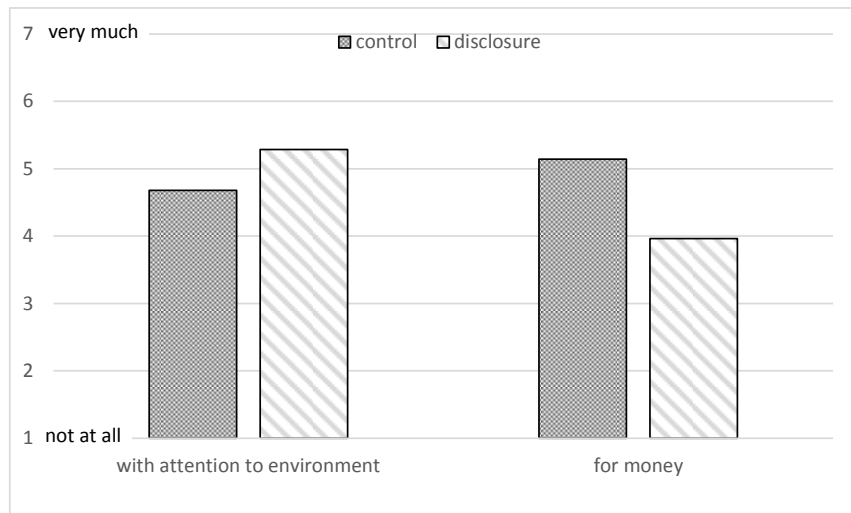


Figure 9. Attitudes in the game

## 5 Conclusion

In this study, there were no penalties for incorrect descriptions on tracking sheets in the disclosure condition. In addition, anyone could fill out tracking sheets and no one could check their contents, so the incentive to provide correct descriptions was weak. This means the information on the tracking sheets was unreliable and hardly effective for monitoring. Nevertheless, filling out tracking sheets decreased non-cooperative behaviors. One reason of the results is commitment or subjective norm. However, it may be not enough persuasive because they filled in the sheet after negotiation and deal which have strong effect more as commitment or subjective norm. In addition, this is the same in the control condition. We need to test about the possibilities. At any rate, although it is imperfect to check the reliability, ensuring the opportunity for information disclosure works. It is noted that we should have a disclosing party determine whether he/she disclose reliable information, which should not imply the strengthening surveillance. These results indicated that it is not always necessary to make tracking sheets traceable for monitoring, but to promote sharing information and common goal with each other for mutual cooperation.

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