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The value of punishment of free riders: A case study on the receiving fee system of the Japanese public broadcasting organization[†]

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Abstract

Social preferences for the punishment of free riders are critical for generating cooperative behavior in human society. Focusing on the receiving fees of Japan's public broadcaster, this study analyzes how punishment of free riders, that is, the strengthening of legal responses against them, affects the willingness to pay (WTP) of general viewers. Preferences regarding punishments were found to have significant positive effects on WTP. Furthermore, differences of perception about the institutional framework around receiving fees and differences in type concerning cooperative behavior were found to influence these effects clearly.

JEL Classifications: D63; H41; K42

Keywords: Public goods; Social preference; Free riding; Punishment; WTP

1 Introduction

NHK¹, the only Japanese public broadcaster, has been working for resolution of its free rider problem. All of its running costs are covered by the receiving fees paid by every household. Though they are obliged to pay the fee so long as they have televisions, around quarter of them do not pay it every year. Since NHK is the public broadcaster, they are so called free riders who consume a public service without paying the cost. In recent years, NHK has set out to enforce legal measures against such free riders.

Some public opinion is strongly opposed to the NHK's such policy. On the other hand, the punishment of free riders in the context of public goods provision is a major issue with regard to social preferences in theory. Contrary to the critical public opinion against the legal punishments conducted by NHK, much of the previous study shows that people other than the free riders are generally willing to bear some costs so that free riders may be punished. As Fehr and Gächter (2002) argue, despite the fact that punishments have no material benefits, they can be seen as altruistic insofar as people bear cost in order to deter future free riding. The altruistic punishment, then, may be key to generating cooperative behavior within human society.

Most previous studies on this issue have been carried out using experimental methods. Using a two-stage public good game, Fehr and Gächter (2000) study how participants respond in the second stage

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¹ The abbreviation of "Nippon Hoso Kyokai" (Japan Broadcasting Corporation).

of the game towards participants who free rode in the first stage of the game. They found that participants were willing themselves to assume a certain level of cost in order to punish free riders. Experiments conducted by Fehr and Fischbacher (2004) show that even third parties with no direct interest in the outcome of the game were willing to punish behavior considered unjust, albeit not as fervently as the direct stakeholders. Accordingly, the authors argue that preference for punishment may occur even in cases in which a game has many participants and the dishonesty of one participant affects the interests of others only very marginally. A third-party punishment game carried out by Henrich et al. (2006) achieves similar results in this regard. Boyd et al. (2003) report that altruistic punishments can be observed also within one-shot games. Using a multi-stage game, Gächter et al. (2008) argues that the presence of punishments may increase social welfare in the long term.

Furthermore, preferences concerning punishments have been shown to be influenced by individual type, personal attributes, and a variety of other factors. Henrich et al. (2006) conducts experiments using samples from 15 different regions and ethnicities, and finds that while a preference for punishment is common to all samples, the strength of preferences varies greatly. Nece and Sbriglia (2009) find a correlation between preferences for punishment emerging from a repeated public good game as well as survey data on social participation, cooperativeness, and attitudes toward free riders. Many other studies focus on preferences concerning punishments (e.g., Fehr and Rochenbach, 2003; Masclet et al., 2003; Sefton et al., 2007; Darcet and Sornett, 2008; Croson and Konow, 2009; Ertan et al., 2009; Xiao and Houser, 2011; MacEvoy, 2012; Nikiforakis and Mitchell, 2014).

In light of these previous studies, it is possible that the legal punishment conducted by NHK would give a positive utility to the majority of NHK viewers who properly pay the receiving fees. To examine this hypothesis, we use WTP, the amount of how much people are willing to pay in contribution to NHK's total running costs. Since NHK imposes no additional costs to viewers to carry out the punishment, the positive utility arise from the punishments will be additionally reflected for the WTP. We try to extract the amount of WTP that is corresponding to the utility.

The rest of the paper is structured as follows. Section 2 provides a broad explanation of NHK's receiving fee system. Section 3 explains the data and outlines the main variables used. Sections 4 and 5 deal with estimation strategies and estimation results, respectively. Section 6 summarizes the conclusions.

2 NHK's receiving fee system

NHK was established in 1950. Although an independent public organization having its own fiscal resource, it is subject to rules similar to those for government departments. Its administrative organization, missions and operations are strictly regulated by the Broadcast Act., and its yearly budget plan must be approved by the Diet.

NHK currently maintains the following four channels: two terrestrial broadcasting channels, NHK-General (GTV) and NHK-Educational (ETV), and two satellite channels, NHK-BS1 (BS1) and

NHK BS-Premium (BSP). All of NHK's operations are paid for by the receiving fees gathered by NHK from its viewers. Households and establishments that own a television and do not meet certain exemption criteria are "contract households (establishments)" and are obliged by the Japanese Broadcast Act to sign broadcast reception contracts with NHK. The number of contract households and establishments are about 46.52 million and 3.73 million in 2015, respectively.

Two types of contracts exist, one for the reception of terrestrial broadcasting only (a "terrestrial contract") and the other for both terrestrial and satellite broadcasting (a "satellite contract"). While fee prices vary slightly according to the method of payment, in principle, a monthly receiving fee of 1,260 yen is payable under the terrestrial contract, and a monthly fee of 2,230 yen is payable under the satellite contract. Thus, the difference between the two yields the receiving fee for satellite broadcasting only, that is, 970 yen. However, contracts for satellite broadcasting only are not permitted, with the exception of a very small number of regions. The number of terrestrial contracts and satellite contracts are 20.29 million and 19.48 million in 2015, respectively. The revenue from those contracts is 662.5 billion yen, which accounts for 96.5% of NHK's total revenue.

Public broadcasters in other countries, such as BBC, ZDF, FTV and KBS, has legal sanctions for nonpayment of receiving fees (or other fees or taxes akin to that) and any behavior which cause the nonpayment to be raised, such as delaying report of television setting. Accordingly, the payment rates are almost 100%. In contrast, NHK does not have such legal sanctions against nonpayment. According to NHK announcements, the percentage of contract households that correctly paid the subscription was 70.1% in 2009 and 71.2% in 2010. NHK terrestrial broadcasting can be viewed by anyone with a television set, regardless of whether they have paid the receiving fee or not. The same applies to satellite broadcasting, provided the person owns an antenna and television set that is capable of receiving these transmissions. Thus, households that do not pay the receiving fees, which number a little less than 30% of all contract households, are considered free riders. As no criminal penalty has been stipulated for the free riding, the conventional way that NHK has been carried out to improve the payment rate are dunning letters, door-to-door visits for each free-riding household and persuasions by their staffs.

These free riders can be divided into two categories: those that have not signed the receiving contract with NHK (uncontracted) and those that have signed the contract but are yet to pay the fees (unpaid). In 2006, NHK announced in its medium-term management plan that it would make demands for payment of receiving fees from the latter group via civil proceedings in court. Indeed, in July 2009, proceedings were launched and the Tokyo District Court ordered two people to pay the receiving fees. In addition to demands for payment directed at those yet to do so, NHK's 2009 medium-term management plan revealed the broadcaster's intention to carry out civil proceedings against uncontracted viewers. In line with this objective, NHK launched a civil action against five uncontracted households to demand that they sign contracts and pay the required receiving fees. This case against uncontracted households was the first of its kind since NHK was established in 1950, and widespread media coverage of the case

ensured it was seen widely by the general public. Subsequently, there have been multiple court proceedings launched against uncontracted households and demands have been made for the payment of fees. Since then, the payment rate has shown some improvement, reaching 74% in 2013, 75.6% in 2014, and 76.1% in 2015.

3 Data

The datasets used in this study are the results of the “Survey of Television Viewing” conducted in July 2012, January 2013, January and July 2014, January 2015, January 2016 and January 2017. This survey was commissioned by NHK, but was conducted by an independent research organization to ensure objectivity. Respondents are not informed of the NHK’s commission. The questions are not limited to NHK but encompass television viewing in general. The survey involves a combination of the interview and leaving methods. The response rates are a little more than 50%² and each collected sample contains around 2,000 individuals. Respondents are selected randomly from the national population aged 15 years and older prior to each survey. Data from five such surveys are pooled for use here.

3.1 Endogenous variables

The purpose of this study is to examine whether the respondents perceive positive value from the NHK’s legal punishments for free riders or not. The simplest way for that may be to directly ask them the WTP for the punishments, that is, the cost amount that they are willing to pay to carry them out. In our case, however, the punishments have already been carried out by NHK with no additional costs for these years. Therefore, we ask the respondents the WTP for NHK’s total running costs instead of that for the punishments themselves because it is plausible to consider that they have already recognized the punishments as parts of the entire management activities of NHK. It must be difficult for them to exactly cut out the corresponding value of the punishments from the total value of NHK they perceive. Moreover, in case they are asked the WTP for the punishments, it is likely that they strategically answer a lower value than the actual one since the punishments have currently been provided with no extra charges. In order to avoid these possible biases, we collect the total WTP and the evaluation for the punishments of each respondent so as to estimate the value of the punishments as the difference between average amounts of WTP of those who positively evaluate the punishments and of those who do not.

The data of the total WTP were collected in interview surveys using multiple bounded dichotomous choice, a contingent valuation method commonly used to obtain WTP values for public goods. For terrestrial broadcasting, for example, the following question was read aloud, and then, the WTP price selection options were presented in the order shown in Figure 1.

² The response rates for the interview surveys were, in the order of first to last survey rounds, 59.4%, 57%, 57.9%, 56%, and 55.8%. The response rates for surveys left with respondents were, in the same order, 55.8%, 53.6%, 53.3%, 51.2%, and 51.8%.

“Please assume that the current NHK receiving fee is eliminated. In this context, would you pay a monthly charge of ¥1,500 to view the information and services currently available on NHK General TV, NHK Educational TV, the radio, and the Internet? This charge would be used for essential operations required for the maintenance of public broadcasting—for example, the production of various programs offered by NHK and the development of technologies required for broadcasting. As this monthly charge would come out of your household finances, when answering, please take into account the effect this would have on your household. Further, please note that your answer to this question will have no influence on your current NHK receiving fee.”

[Insert Figure1 and Table 1 around here]

Accordingly, answers were assigned to one of eight price intervals with given threshold values. The same question was asked with regard to WTP for satellite broadcasting. The distribution of answers used in the estimation is shown in Table 1.

Another endogenous variable is the attitudes of respondents towards the strengthening of measures against free riders. These are captured by the following question in the questionnaire left with respondents:

“NHK is currently carrying out legal action and demanding payment of receiving fees from households and enterprises that have not contracted NHK broadcasting services even though they own a television. What is your opinion of such actions by NHK?”

Answers to this question are divided into the following four levels: “in favor,” “more or less in favor,” “more or less against,” and “against.” To simplify the estimation, we convert these answers to a dummy variable with 1 assigned to “in favor” and “more or less in favor.” This dummy variable is identified here as willingness to punish free riders (WTPF). As shown in the descriptive statistics in Table 3, WTPF is indicated by 64% of the sample used in the terrestrial broadcasting estimation and 67% of the sample used in the satellite broadcasting estimation.

3.2 Independent variables

Respondents’ personal attributes are captured by data about gender, age, income bracket, employment status, and prefecture of residence. Gender is used as a dummy variable in which male=1 and female=0. Age is a continuous variable. Responses regarding income brackets are separated into 10 categories ranging from “no income” to “above 20 million yen.” Employment status is captured by the four categories of “employed,” “homemaker,” “student,” and “unemployed,” each of which has been

converted to a dummy variable. For place of residence, dummy variables were assigned to each of the 47 Japanese prefectures.

Attitudes towards the content of NHK broadcasting are expected to influence WTP and WTPF. The present surveys enquire into attitudes towards GTV, ETV, BS1, and BSP with reference to the 10 indicators shown in Table 2. The evaluation totals for GTV and ETV are used as the evaluation score for terrestrial broadcasting, while the evaluation totals of BS1 and BSP are used as the evaluation score for satellite broadcasting. Accordingly, terrestrial and satellite broadcasting may each have a maximum evaluation score of 200 points.

[Insert Table 2 around here]

In addition to these evaluations, each of the four channels is assessed in terms of “importance” and viewer “satisfaction.” These answers are accorded an integer value of between 1 and 5. In addition, hours spent viewing NHK broadcasts are used as an independent variable against WTP. These are classed with integers of 1-hour intervals, beginning with “0: almost never/not at all” to “9: more than 9 hours.”

Furthermore, attitudes towards the receiving fee system itself are considered. While the payment of NHK receiving fees is a legal requirement, it is not a tax collected by any government agency and it differs from general public service fees collected on a pay-for-usage basis. Indeed, the general viewing public is not always aware of the unusual status of the fee. The survey asks respondents whether they agree with, neither or disagree with a series of statements interpreting the intent of the receiving fees, such as the following:

- A. As the nation's public broadcaster, NHK broadcasting is a public good for which everybody should shoulder the cost.*
- B. Receiving fees should be paid as the price for viewing NHK programming.*
- C. As a public broadcaster, the NHK should receive expenditure from the national government.*

Respondents who agreed with statement A correctly understood NHK receiving fees as the cost of a public good. Those who agreed with Statement B interpreted the receiving fee as the price for viewing NHK programming, and might have seen the payment of the fee much in the same way as a transaction of usual consumer products. Meanwhile, those who agreed with statement C confused public broadcasting with state-run broadcasting. Given the present fee system, statements B and C are typical misperceptions. Nevertheless, many amongst the viewing public indeed hold such views. Such differences in the fundamental perception of viewers in relation to the institutional framework around the fee may exert a framing effect on respondents' perceptions of fairness (e.g., Issac et al., 1991; Elliot et al., 1998). These responses are used here by applying the following values: “neither” = 0, “agree”= 1 and “disagree”= -1. Descriptive statistics for these variables are shown in Table 3.

[Insert Table 3 around here]

3.3 Removal of free riders and protest responses

The purpose of this study is to test the effects that punishment of free riders has on other participants. This requires the removal of responses from free riders themselves. The surveys used here ask whether the household of each respondent has paid the receiving fee, to which the possible responses are as follows: A. paid for satellite and terrestrial broadcasting; B. paid for terrestrial broadcasting only; or C. have not presently paid any NHK receiving fee. Respondents who selected answer C are considered either exempt from payment or free riders, and thus, have been removed from the sample. In addition, respondents who selected answer B as well as responded affirmatively to the statement “I am able to view satellite broadcasts” were removed from the sample.

Next, any protest responses regarding WTP were removed. In surveys of WTP for public goods, in general, some respondents may refuse to provide answers or respond with extremely low amounts of money for reasons that are not related to their evaluation of the public good itself. In the present surveys, for instance, respondents who set their WTP at “less than 249 yen” were asked to provide a specific amount that they would pay for the service. Those who answered “0 yen” provided further reasons for this, some indicating a particular political stance or financial difficulty in justifying their non-WTP (in other words, reasons that were unrelated to their evaluation of broadcast content). These were considered protest responses and were removed from the sample.

4 Estimation Strategies

As explained in section 3.1, the present surveys ask respondents to assess their WTPF, that is, their assessment of legal action and stronger enforcement of payment against free riders. If a social preference in favor of the punishment of free riders is present, this would have a positive effect on WTP.

However, WTPF is also considered an endogenous variable defined as dependence on the personal attributes of respondents and their evaluation of NHK content. In accordance with this, the following model is proposed.

$$y_{1i}^* = \delta y_{2i} + \mathbf{x}_{1i}' \boldsymbol{\beta}_1 + \varepsilon_{1i} \quad (1)$$

$$y_{2i}^* = \mathbf{x}_{2i}' \boldsymbol{\beta}_2 + \varepsilon_{2i} \quad (2)$$

$$y_{1i} = \begin{cases} 1 & \text{if } y_{1i}^* < l_1 \\ \vdots \\ j & \text{if } l_{j-1} \leq y_{1i}^* < l_j \\ \vdots \\ J & \text{if } l_{J-1} \leq y_{1i}^* \end{cases}$$

$$y_{2i} = \begin{cases} 0 & \text{if } y_{2i}^* < 0 \\ 1 & \text{if } y_{2i}^* \geq 0 \end{cases}$$

$$\begin{pmatrix} \varepsilon_{1i} \\ \varepsilon_{2i} \end{pmatrix} \sim N(\mathbf{0}, \boldsymbol{\Sigma}) \quad \text{where } \boldsymbol{\Sigma} = \begin{pmatrix} \sigma & \rho\sigma \\ \rho\sigma & 1 \end{pmatrix}$$

y_{1i}^* is the individual's WTP amount and y_{2i}^* is the standardized evaluation value of WTPF. Neither can be observed directly and the actual observed values are obtained as y_{1i} and y_{2i} , respectively. y_{1i} is an ordinal variable that assumes the value at J in response to the value of y_{1i}^* . Here, each threshold value l_j is given. On the other hand, y_{2i} is a dummy variable assuming the value of either 1 or 0 according to the value of y_{2i}^* . Since WTPF indicates the innate preference for punishment, we do not assume that it is affected by WTP.

Error terms in both equations follow a bivariate normal distribution with covariance matrix Σ . Namely, this is an interval regression model that recursively contains an endogenous dummy regressor. The likelihood of this model is obtained from the joint probability of error terms. Showing the distribution function of the zero-centered bivariate normal distribution with correlation coefficient ρ as $\Phi(\cdot, \cdot, \rho)$,

if $y_{1i} = j, 2 \leq j \leq J - 1$

$$\begin{aligned} P(y_{1i} = j, y_{2i} = 1) &= \Phi(\theta_{1i,1,j}, \theta_{2i}, \rho) - \Phi(\theta_{1i,1,j-1}, \theta_{2i}, \rho) \\ P(y_{1i} = j, y_{2i} = 0) &= \Phi(\theta_{1i,0,j}, -\theta_{2i}, -\rho) - \Phi(\theta_{1i,0,j-1}, -\theta_{2i}, -\rho). \end{aligned}$$

If $y_{1i} = 1$ or $y_{1i} = J$, then

$$\begin{aligned} P(y_{1i} = 1, y_{2i} = 1) &= \Phi(\theta_{1i,1,1}, \theta_{2i}, \rho) \\ P(y_{1i} = 1, y_{2i} = 0) &= \Phi(\theta_{1i,0,1}, -\theta_{2i}, -\rho) \\ P(y_{1i} = J, y_{2i} = 1) &= 1 - \Phi(\theta_{1i,1,J-1}, \theta_{2i}, \rho) \\ P(y_{1i} = J, y_{2i} = 0) &= 1 - \Phi(\theta_{1i,0,J-1}, -\theta_{2i}, -\rho). \end{aligned}$$

where,

$$\begin{aligned} \theta_{1i,1,j} &= (l_j - \delta - \mathbf{x}_{1i}'\boldsymbol{\beta}_1)/\sigma \\ \theta_{1i,0,j} &= (l_j - \mathbf{x}_{1i}'\boldsymbol{\beta}_1)/\sigma \\ \theta_{2i} &= \mathbf{x}_{2i}'\boldsymbol{\beta}_2. \end{aligned}$$

From these, the log likelihood function can be written as

$$\ln L(\delta, \boldsymbol{\beta}_1, \boldsymbol{\beta}_2, \sigma, \rho | \mathbf{y}_1, \mathbf{y}_2, \mathbf{x}_1, \mathbf{x}_2) = \sum_i \sum_j \sum_k d_{jk} \ln P(y_{1i} = j, y_{2i} = k)$$

where $d_{jk} = \begin{cases} 1 & \text{if } y_{1i} = j \text{ and } y_{2i} = k \\ 0 & \text{otherwise} \end{cases}$

Here, if the null hypothesis of correlation coefficient $\rho = 0$ cannot be rejected, it is preferable to conduct the estimation having controlled for this beforehand. The actual procedure is to conduct the estimation using both unrestricted and restricted models, where $\rho = 0$, and then, to test ρ to judge which is appropriate.

As described above, our model consists of two endogenous variables, the one is recursively included in the equation of the other. Using a multivariate probit model as an example, Wilde (2000) argues that

such a model does not give rise to identification problems, and accordingly, there is no need to consider exclusion restriction. Greene and Hensher (2010, p.90) and Greene (2012, p.785) also point out that all exogenous variables may appear in both equations in the maximum likelihood estimation of such a model. Following these arguments, we use same set of explanatory variables for both equations.

5 Estimation results

The main estimation results are shown in Tables 4 to 6. Though not shown in the tables, prefectural dummies and survey date dummies were included as control variables in all models. The main outcomes are summarized in order below.

5.1 Willingness to punish free riders effects

Table 4 shows the results of estimation for both terrestrial and satellite broadcasting utilizing the entire sample. In all the models, the estimated value of ρ is non-significant. Furthermore, from the results of Wald and likelihood ratio tests for the null hypothesis $\rho = 0$, neither is able to reject the null hypothesis. Thus, there is no necessity to assume a correlation amongst error terms.

[Insert Table 4 around here]

The estimation results of the restricted model where $\rho = 0$ are as follows. With regard to terrestrial broadcasting, the WTPF coefficient is 170.074, which is significant at 1% level. In other words, even when controlling for the various factors, such as personal attributes, attitudes toward broadcast content and levels of perception of the receiving fee system, a significant difference in average WTP of around 170 yen exists between those indicating WTPF and those not.

Which factors exert influences on WTP and WTPF? Much of this influence is defined by the personal attributes of respondents. Looking at the coefficient estimated value for gender, male WTP is higher on average compared to that of females, yet lower for WTPF. In addition, age exert positive effects. Older people tend to have higher WTP and stronger attitudes towards the punishment of free riders.

The influence of attitudes toward the content of broadcasts can be predicted, for obvious reasons. Both the perceived importance of and satisfaction with GTV, the broadcaster's principal channel, have large effects on both WTP and WTPF.

Here, we focus in particular on the influences of perceptions concerning the fee's institutional framework. In relation to terrestrial broadcasting, the coefficient estimated values of "cost of a public good" and "price of viewing" were 67.486 and 94.482, respectively. In other words, respondents who held these views indicated an average WTP roughly 67 yen and 94 yen higher, respectively, than those who did not. Conversely, the WTP of those who believed that broadcasting should be paid for by the government was 53 yen lower.

At the same time, perceptions of the institutional framework influenced respondents' WTPF. Respondents who considered the receiving fee in terms of bearing the expenses of a public good also

showed the strongest WTPF. The WTPF of respondents who believed the fee was simply the price of viewing broadcasting was lower. Most likely, those respondents who understood the relationship between viewing NHK broadcasting and the receiving fee as a simple commercial transaction between themselves and NHK had less of an interest in the free riding of others. Such an interpretation likely weakens the legitimacy of present fee arrangements, whereby NHK levies the fee on its own terms and, as a result, the punishment of free riders may lose moral legitimacy (Fehr and Rockenbach, 2003).

The trends regarding satellite broadcasting were essentially the same as those for terrestrial broadcasting. That is, estimated values of the correlation coefficients of error terms were non-significant. Observing the results of the restricted model, WTPF had a significant influence on WTP of roughly 89 yen. Gender and age exerted influences on both WTP and WTPF, with the same signs as estimated values for terrestrial broadcasts. Respondent evaluations of broadcast content exerted direct influence on WTP. Comparing estimated coefficient values, both importance and satisfaction held slightly larger influences for BSP than for BS1. However, neither of these had any particular effect on WTPF. On the other hand, perception of the receiving fee system influenced both WTP and WTPF, the direction of signs being the same as with terrestrial broadcasting.

6 Differences in cooperative behavior types

In general terms, the cooperative behavior that people display can be grouped into different types. Fischbacher et al. (2001) divide participants in public goods games into free riders and conditional cooperators. The latter refers to participants who regulate their levels of contribution in response to that of others. Fischbacher et al. (2001) find that approximately half of the subjects in their experiments could be classified as conditional cooperators. Conducting similar experiments in Japan, the United States, and Australia, Kocher et al. (2008) report that the percentage of conditional cooperators is notably higher in the United States compared to the other two countries. Burlando and Guala (2005) classify subjects within repeated public goods games as cooperators, free riders, and reciprocators (conditional cooperators). Fischbacher and Gächter (2010) use a similar classification. In general, conditional cooperators account for a significant portion of individuals, and their actions are thought to have an undeniable influence on the maintenance of cooperative behavior (e.g., see field experiments by Frey and Meier, 2004; Croson et al., 2005; Gächter, 2006).

As explained in Section 3.3, this study excludes free riders from the analysis; samples include only viewers who correctly pay receiving fees. Nevertheless, even if respondents pay receiving fees, there may be some differences between those who might possibly free ride in the future and those who will not. The present survey asks respondents the following question.

“If other people do not pay receiving fees, I would not want to pay either.”

Those who agreed with this statement were defined as conditional cooperators, and those who disagreed were defined as unconditional cooperators. The same analysis as in the previous section was performed using samples for each.

[Insert Table 5 around here]

Table 5 shows the analysis results for each type in relation to terrestrial broadcasting. In both cases, correlation coefficients of error terms from simultaneous estimation were not significant. Interestingly, from restricted model results, we find that only in the analysis of conditional cooperators does WTPF have a positive effect on WTP. With a coefficient estimated value of 178.720, it is roughly 8 yen higher than the estimated value when utilizing the entire sample. Conversely, the WTPF effect of unconditional cooperators is 108.226, much lower than that of entire sample. The same trends can be observed regarding satellite broadcasting, shown in Table 6. That is, the coefficient estimated value for WTPF in analysis of conditional cooperators is significantly positive at 107.693. This value is around 19 yen higher than the estimation result using the entire sample. On the other hand, the coefficient estimated value of WTPF for unconditional cooperators is only 38.315.

[Insert Table 6 around here]

These results imply that the social preference for punishment of free riders may be heightened by the presence of conditional cooperators. Table 7 shows the average values for predicted WTP obtained from a restricted model and the number of observations. These indicate that predicted WTP is higher for unconditional cooperators than for conditional cooperators. In addition, the portion of viewers indicating WTPF is larger for unconditional cooperators than for conditional cooperators. Nevertheless, conditional cooperators are more likely to discern the value of punishing free riders. Unlike unconditional cooperators who exhibit cooperative behavior quite autonomously, conditional cooperators engage in cooperative behavior—in this case, by correctly paying the receiving fee—at the same time as they retain the possibility of free riding themselves, and thus, may assess the value of altruistic punishments more highly.³

[Insert Table 7 around here]

6 Conclusions

This study examined the effects on viewers who correctly pay NHK receiving fees exerted by the punishment of those who do not, that is, by NHK's strengthening of legal measures against free riders. The literature on the punishment of free riders predicts positive utility for other market participants. In the present case, punishments are carried out by NHK and no additional costs have been levied on existing

³ Similar results were obtained in estimations that did not exclude protest responses. The coefficient estimated value of WPTF was 120.034 ($p=0.000$) for the entire sample, 151.033 ($p=0.000$) for conditional cooperators only, and non-significant for unconditional cooperators. However, this value was non-significant in each case for satellite broadcasting.

viewers. Accordingly, if positive utility does indeed arise from punishing free riders, this may be expressed as an increased WTP.

Analysis conducted based on this assumption shows that even when controlling for various factors, such as personal attributes, a significant difference in WTP can be observed between those who approve of punishment and those who do not. This result is consistent with the underlying assumption. In other words, viewers who approve of punishments may be seen to derive utility from them. Obtaining a hypothetical monetary value of the average utility thus derived, amounts equivalent to around 170 yen and 89 yen are observed for NHK's terrestrial broadcasting and satellite broadcasting, respectively.

Social preferences for the punishment of free riders are influenced by a range of factors. In the present analysis, the personal attributes of viewers and valuations of broadcast content influenced WTPF. In addition, perception of the institutional framework around receiving fees had a notable effect. Viewers who understood the fee as simply a cost to be paid in return for viewing NHK broadcasts indicated a high WTP, but saw relatively low value in punishing free riders compared with viewers who correctly saw the receiving fee as a cost assumed for the consumption of a public good. Furthermore, viewers who believed that the payment of NHK receiving fees should be borne by the national government showed both lower valuations of the punishment of free riders and a lower WTP.

In addition, this study shows that preferences regarding punishments may differ due to different cooperative behavioral types. While the positive utility of free-rider punishment was larger for conditional cooperators, it was not observed for unconditional cooperators. Conditional cooperators, determining their level of cooperative behavior in response to that of others, may estimate more highly the value of punishing free riders as a key to generating cooperative behavior. According to Kocher et al. (2008), the number of conditional cooperators within a given nation or ethnic group can vary. Thus, average WTPF may be greater in those societies with a larger percentage of conditional cooperators.

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Figure 1. The structure of WTP survey

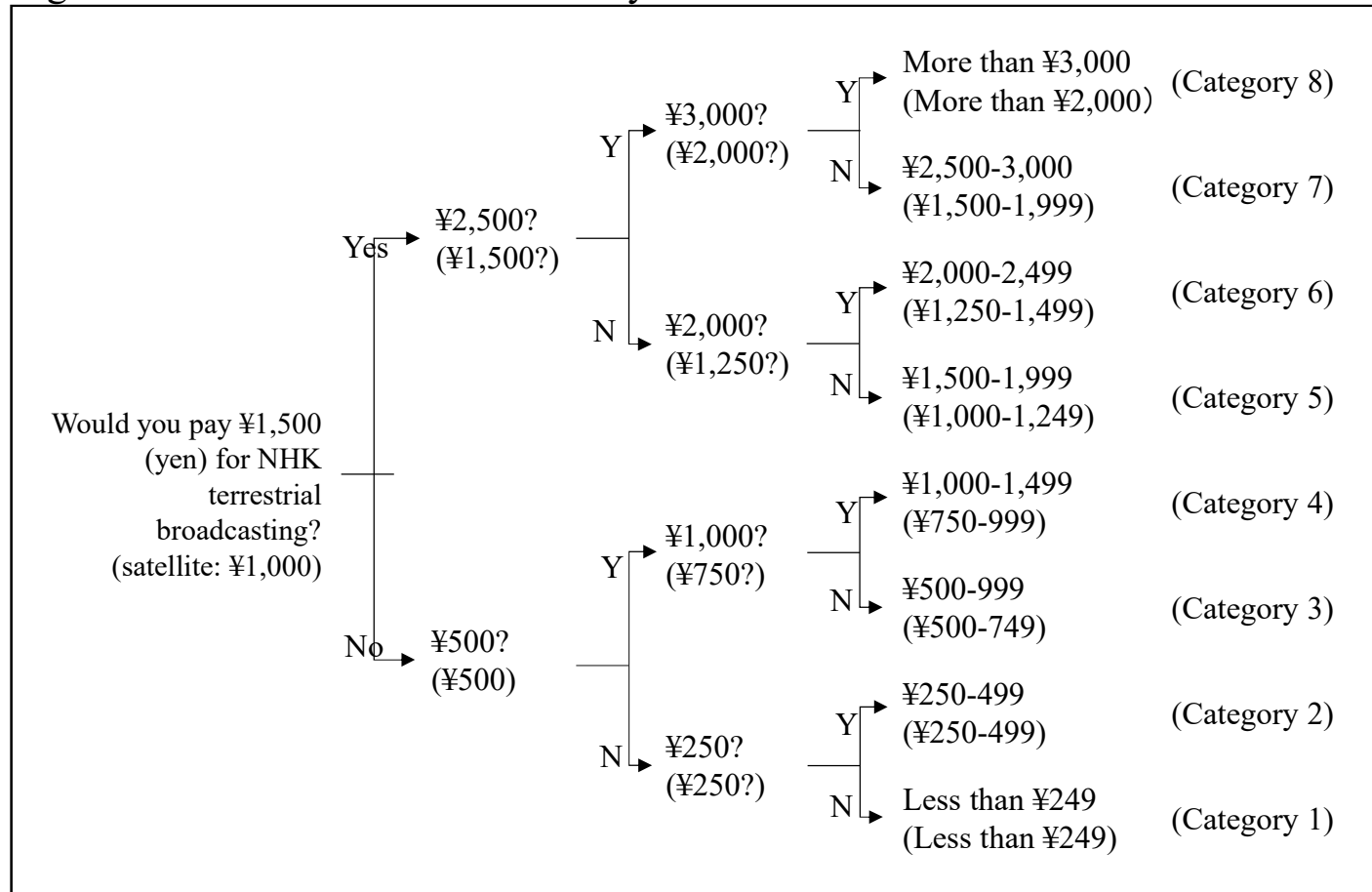


Table 1. The distribution of WTP

Categories	Terrestrial broadcasting		Satellite broadcasting	
	Freq.	Rel. Freq.	Freq.	Rel. Freq.
8	366	3.7	441	6.76
7	789	7.99	778	11.92
6	1093	11.06	362	5.55
5	2648	26.8	1753	26.86
4	1016	10.28	365	5.59
3	2063	20.88	1401	21.47
2	545	5.52	673	10.31
1	1361	13.77	753	11.54
Total	9881	100	6526	100

Table 2 10 Indicators for Channel Evaluation

- a. Well designed and produced
 - b. Gives accurate information quickly
 - c. Seeks new perspectives and directions
 - d. Makes me think about social issues
 - e. Educates younger generations
 - f. Provides helpful information for daily life
 - g. Provides information that enriches my life
 - h. Helps me relax
 - i. Is exciting and stimulating
 - j. Is moving/leaves a lasting impression
-

Table 3 Descriptive statistics

	Terrestrial broadcasting (No. of obs.=9884)				Satellite broadcasting (No. of obs.=6527)			
	Mean	Std.Dev.	Min	Max	Mean	Std.Dev.	Min	Max
WTPF	0.64	0.48	0	1	0.67	0.47	0	1
Personal attributes								
Gender (Female=0, Male=1)	0.44	0.50	0	1	0.45	0.50	0	1
Age	53.89	18.05	16	96	54.42	17.87	16	96
Income (No income=0)								
Less than 2000 thousand yen	0.36	0.48	0	1	0.35	0.48	0	1
2000-4000	0.25	0.43	0	1	0.26	0.44	0	1
4000-6000	0.11	0.32	0	1	0.11	0.32	0	1
6000-8000	0.06	0.23	0	1	0.06	0.24	0	1
8000-10000	0.03	0.16	0	1	0.03	0.17	0	1
10000-12000	0.01	0.09	0	1	0.01	0.10	0	1
12000-15000	0.01	0.08	0	1	0.01	0.08	0	1
15000-20000	0.00	0.06	0	1	0.00	0.06	0	1
Above 20000	0.00	0.04	0	1	0.00	0.05	0	1
Employment status (employed=0)								
Homemaker	0.17	0.38	0	1	0.17	0.38	0	1
Student	0.05	0.22	0	1	0.05	0.22	0	1
Unemployed	0.20	0.40	0	1	0.21	0.41	0	1
Evaluation of broadcast content								
Importance (GTV or BS1)	3.91	1.18	0	5	2.94	1.25	0	5
Importance (ETV or BSP)	3.13	1.27	0	5	2.93	1.25	0	5
Satisfaction (GTV or BS1)	3.84	0.97	0	5	3.28	0.89	0	5
Satisfaction (ETV or BSP)	3.42	0.93	0	5	3.31	0.91	0	5
Total score on 10 indicators	114.53	46.32	0	200	100.64	58.39	0	200
Understanding of fee system								
Cost of public good	0.72	0.89	-1	3	0.74	0.84	-1	3
Price of viewing	0.66	0.94	-1	3	0.69	0.89	-1	3
Should be paid by government	0.43	1.13	-1	3	0.39	1.15	-1	3
Hours viewing NHK	1.77	2.21	0	9	1.82	2.13	0	9

Table 4 Estimation results: Entire sample

		Terrestrial broadcasting						Satellite broadcasting					
		Restricted model			Unrestricted model			Restricted model			Unrestricted model		
		(ρ=0)						(ρ=0)					
		Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.		
Eq.1: WTP	WTPF	170.074 ***	18.206	290.621 **	123.865	88.920 ***	14.047	185.864 *	100.373				
	Personal attributes												
	Gender (Female=0)	74.033 ***	19.167	78.586 ***	19.737	41.365 ***	14.801	47.243 ***	16.008				
	Age	7.988 ***	0.655	7.542 ***	0.797	3.139 ***	0.501	2.735 ***	0.651				
	Income (No income=0)												
	Less than 2000 thousand yen	48.889 *	26.367	45.543 *	26.620	57.805 ***	20.719	55.172 ***	20.937				
	2000-4000	108.284 ***	29.695	101.923 ***	30.413	67.781 ***	23.115	61.654 **	23.990				
	4000-6000	49.791	35.791	42.895	36.503	54.284 *	28.020	47.795 *	28.839				
	6000-8000	75.990 *	44.035	67.516	44.907	51.669	33.419	42.052	34.920				
	8000-10000	167.959 ***	57.408	160.174 ***	58.007	101.626 **	43.237	91.782 **	44.474				
	10000-12000	140.277	91.821	125.847	93.048	85.421	65.029	68.464	67.486				
	12000-15000	337.541 ***	110.075	337.908 ***	109.939	69.719	77.087	72.226	77.345				
	15000-20000	287.260 *	148.216	289.688 *	147.521	191.863 *	115.445	199.064 *	115.348				
	Above 20000	210.898	217.904	213.293	216.738	302.546 **	151.753	301.551 **	150.885				
	Employment status (employed=0)												
	Homemaker	22.167	27.470	17.295	27.933	1.430	21.255	-2.365	21.638				
	Student	141.480 ***	44.732	129.598 ***	46.401	112.752 ***	34.133	103.447 ***	35.532				
	Unemployed	-17.506	26.150	-19.827	26.270	-5.048	20.023	-7.139	20.154				
	Evaluation of broadcast content												
	Importance (GTV or BS1)	132.018 ***	10.636	128.882 ***	11.120	23.945 ***	9.226	24.028 ***	9.241				
	Importance (ETV or BSP)	19.324 **	9.607	19.977 **	9.638	31.235 ***	9.450	30.801 ***	9.474				
	Satisfaction (GTV or BS1)	81.456 ***	13.017	75.996 ***	14.165	42.362 ***	13.251	42.714 ***	13.266				
	Satisfaction (ETV or BSP)	39.505 ***	13.855	40.600 ***	13.911	35.476 ***	13.194	34.362 **	13.254				
	Total score on 10 indicators	2.985 ***	0.213	2.748 ***	0.321	1.151 ***	0.122	1.036 ***	0.170				
	Understanding of fee system												
	Cost of public good	67.486 ***	11.484	61.030 ***	13.242	53.838 ***	9.067	47.849 ***	10.969				
	Price of viewing	94.482 ***	11.050	93.863 ***	11.089	39.917 ***	8.709	37.773 ***	9.006				
	Should be paid by government	-52.961 ***	9.373	-50.630 ***	9.677	-32.854 ***	7.266	-31.403 ***	7.430				
	Hours viewing NHK	60.239 ***	6.082	59.764 ***	6.106	39.940 ***	4.663	39.209 ***	4.725				
	Constant term	-982.506 ***	71.189	-959.993 ***	74.795	-156.825 ***	51.413	-165.010 ***	52.193				
Eq.2: WTPF	Personal attributes												
	Gender (Female=0)	-0.112 ***	0.033	-0.111 ***	0.033	-0.174 ***	0.040	-0.174 ***	0.040				
	Age	0.011 ***	0.001	0.011 ***	0.001	0.012 ***	0.001	0.012 ***	0.001				
	Income (No income=0)												
	Less than 2000 thousand yen	0.091 **	0.046	0.091 **	0.046	0.090	0.057	0.090	0.057				
	2000-4000	0.169 ***	0.052	0.168 ***	0.052	0.200 ***	0.063	0.201 ***	0.063				
	4000-6000	0.181 ***	0.062	0.179 ***	0.062	0.206 ***	0.076	0.205 ***	0.075				
	6000-8000	0.219 ***	0.076	0.217 ***	0.076	0.294 ***	0.090	0.293 ***	0.090				
	8000-10000	0.201 **	0.098	0.203 **	0.098	0.299 **	0.117	0.301 **	0.118				
	10000-12000	0.360 **	0.159	0.359 **	0.159	0.528 ***	0.185	0.522 ***	0.184				
	12000-15000	-0.011	0.184	-0.010	0.184	-0.063	0.204	-0.059	0.205				
	15000-20000	-0.076	0.230	-0.078	0.230	-0.212	0.265	-0.211	0.266				
	Above 20000	-0.065	0.336	-0.071	0.334	0.042	0.362	0.042	0.359				
	Employment status (employed=0)												
	Homemaker	0.135 ***	0.049	0.134 ***	0.049	0.130 **	0.059	0.128 **	0.059				
	Student	0.303 ***	0.075	0.303 ***	0.075	0.290 ***	0.090	0.289 ***	0.090				
	Unemployed	0.070	0.046	0.070	0.046	0.075	0.055	0.078	0.055				
	Evaluation of broadcast content												
	Importance (GTV or BS1)	0.066 ***	0.018	0.066 ***	0.018	-0.007	0.025	-0.007	0.025				
	Importance (ETV or BSP)	-0.015	0.017	-0.015	0.017	0.015	0.026	0.015	0.026				
	Satisfaction (GTV or BS1)	0.134 ***	0.022	0.134 ***	0.022	-0.002	0.036	-0.002	0.036				
	Satisfaction (ETV or BSP)	-0.027	0.024	-0.027	0.024	0.028	0.036	0.028	0.036				
	Total score on 10 indicators	0.006 ***	0.000	0.006 ***	0.000	0.003 ***	0.000	0.003 ***	0.000				
	Understanding of fee system												
	Cost of public good	0.151 ***	0.019	0.151 ***	0.019	0.171 ***	0.024	0.171 ***	0.024				
	Price of viewing	0.019	0.019	0.019	0.019	0.065 ***	0.023	0.065 ***	0.023				
	Should be paid by government	-0.062 ***	0.016	-0.062 ***	0.016	-0.047 **	0.020	-0.047 **	0.020				
	Hours viewing NHK	0.015	0.011	0.016	0.011	0.024 *	0.013	0.025 *	0.013				
	Constant term	-2.013 ***	0.122	-2.014 ***	0.122	-1.223 ***	0.139	-1.226 ***	0.138				
Log likelihood		-22268.253			-22267.746			-15031.941			-15031.499		
ln(σ)		6.615 ***			6.618 ***			6.134 ***			6.580 ***		
atanh(ρ)		0.000			0.098			0.000			0.128		
σ		746.564 ***			748.493 ***			461.494 ***			463.580 ***		
ρ		0.000			0.097			0.000			0.127		
Wald test (H0: ρ = 0)		Wald chi2(1) = 1.014, Prob > chi2 = 0.314						Wald chi2(1) = 0.884, Prob > chi2 = 0.347					
LR test (H0: ρ = 0)		LR chi2(1) = 0.978, Prob > chi2 = 0.323						LR chi2(1) = 0.969, Prob > chi2 = 0.325					
No. of observations		9881						6526					

Legend: *** p<0.01, ** p<0.05, * p<0.1

Table 5 Estimation results by cooperation behavior type (terrestrial broadcasting)

		Conditional cooperators						Unconditional cooperators						
		Restricted model			Unrestricted model			Restricted model			Unrestricted model			
		(ρ=0)						(ρ=0)						
		Coef.	Std.Err.		Coef.	Std.Err.		Coef.	Std.Err.		Coef.	Std.Err.		
Eq.1: WTP	WTPF	178.720 ***	25.459		237.326	189.464		108.266 ***	27.243		168.959	161.489		
	Personal attributes													
	Gender (Female=0)	60.267 **	28.112		63.829 **	30.339		82.336 ***	27.166		83.449 ***	27.312		
	Age	7.518 ***	0.937		7.239 ***	1.296		8.079 ***	0.950		7.948 ***	1.009		
	Income (No income=0)													
	Less than 2000 thousand yen	16.165	38.001		14.475	38.399		46.303	38.176		45.246	38.260		
	2000-4000	115.473 ***	43.092		112.396 **	44.214		72.991 *	42.731		70.464	43.209		
	4000-6000	8.599	51.909		5.583	52.818		70.888	51.128		68.505	51.472		
	6000-8000	-15.121	65.449		-21.140	68.244		87.428	61.170		85.906	61.265		
	8000-10000	112.020	91.329		105.196	93.929		142.280 *	75.808		142.735 *	75.783		
	10000-12000	79.830	161.114		75.606	161.750		144.846	111.065		137.608	112.621		
	12000-15000	74.588	182.859		75.250	182.532		423.761 ***	138.157		426.699 ***	138.279		
	15000-20000	-315.149	261.847		-311.689	262.033		511.800 ***	176.631		512.422 ***	176.185		
	Above 20000	449.296	393.640		442.521	394.457		-29.570	252.511		-22.166	252.752		
	Employment status (employed=0)													
	Homemaker	-22.972	39.689		-24.625	40.053		57.420	39.308		53.872	40.358		
	Student	63.499	63.148		55.356	68.341		233.351 ***	67.713		230.036 ***	68.270		
	Unemployed	-11.850	39.343		-12.112	39.359		-22.986	36.053		-25.581	36.657		
	Evaluation of broadcast content													
	Importance (GTV or BS1)	127.896 ***	15.007		126.471 ***	15.690		116.444 ***	15.859		115.041 ***	16.282		
	Importance (ETV or BSP)	30.634 **	14.106		30.784 **	14.116		17.780	13.452		17.912	13.448		
	Satisfaction (GTV or BS1)	78.330 ***	19.375		75.923 ***	20.858		80.858 ***	18.176		77.952 ***	19.701		
	Satisfaction (ETV or BSP)	32.273	20.966		33.066	21.123		44.192 **	18.865		45.190 **	19.031		
	Total score on 10 indicators	2.961 ***	0.302		2.847 ***	0.473		2.617 ***	0.315		2.507 ***	0.426		
	Understanding of fee system													
	Cost of public good	81.851 ***	15.456		78.613 ***	18.616		77.161 ***	18.031		73.504 ***	20.425		
	Price of viewing	83.426 ***	14.886		83.008 ***	14.952		92.553 ***	17.280		92.166 ***	17.313		
	Should be paid by government	-41.977 ***	13.910		-41.067 ***	14.215		-31.205 **	13.758		-30.197 **	14.006		
	Hours viewing NHK	65.696 ***	8.944		65.419 ***	8.990		56.300 ***	8.778		56.132 ***	8.781		
	Constant term	##### ***	102.650		##### ***	110.581		-775.692 ***	106.368		-774.508 ***	106.347		
Eq.2: WTPF	Personal attributes													
	Gender (Female=0)	-0.175 ***	0.047		-0.175 ***	0.047		-0.056	0.050		-0.056	0.050		
	Age	0.014 ***	0.002		0.014 ***	0.002		0.007 ***	0.002		0.007 ***	0.002		
	Income (No income=0)													
	Less than 2000 thousand yen	0.089	0.065		0.089	0.065		0.061	0.072		0.060	0.072		
	2000-4000	0.156 **	0.073		0.156 **	0.073		0.143 *	0.080		0.142 *	0.080		
	4000-6000	0.153 *	0.088		0.153 *	0.088		0.128	0.094		0.126	0.094		
	6000-8000	0.304 ***	0.111		0.303 ***	0.111		0.085	0.111		0.084	0.111		
	8000-10000	0.339 **	0.154		0.340 **	0.154		-0.003	0.135		-0.003	0.135		
	10000-12000	0.199	0.266		0.199	0.266		0.396 *	0.210		0.395 *	0.210		
	12000-15000	-0.050	0.286		-0.049	0.285		-0.151	0.245		-0.150	0.246		
	15000-20000	-0.184	0.378		-0.185	0.378		-0.072	0.305		-0.076	0.305		
	Above 20000	0.346	0.633		0.343	0.634		-0.371	0.374		-0.372	0.372		
	Employment status (employed=0)													
	Homemaker	0.090	0.068		0.090	0.068		0.201 ***	0.076		0.200 ***	0.076		
	Student	0.401 ***	0.104		0.401 ***	0.104		0.196	0.120		0.196	0.120		
	Unemployed	0.026	0.067		0.027	0.067		0.145 **	0.068		0.145 **	0.068		
	Evaluation of broadcast content													
	Importance (GTV or BS1)	0.064 **	0.025		0.064 **	0.025		0.058 **	0.028		0.057 **	0.028		
	Importance (ETV or BSP)	-0.008	0.024		-0.008	0.024		-0.006	0.025		-0.006	0.025		
	Satisfaction (GTV or BS1)	0.119 ***	0.033		0.119 ***	0.033		0.149 ***	0.033		0.149 ***	0.033		
	Satisfaction (ETV or BSP)	-0.040	0.036		-0.040	0.036		-0.052	0.035		-0.052	0.035		
	Total score on 10 indicators	0.006 ***	0.001		0.006 ***	0.001		0.006 ***	0.001		0.006 ***	0.001		
	Understanding of fee system													
	Cost of public good	0.154 ***	0.025		0.155 ***	0.026		0.173 ***	0.031		0.173 ***	0.031		
	Price of viewing	0.022	0.025		0.022	0.025		0.023	0.031		0.023	0.031		
	Should be paid by government	-0.048 **	0.024		-0.048 **	0.024		-0.056 **	0.025		-0.056 **	0.025		
	Hours viewing NHK	0.015	0.015		0.015	0.015		0.014	0.017		0.014	0.017		
	Constant term	-2.054 ***	0.171		-2.052 ***	0.171		-1.612 ***	0.193		-1.613 ***	0.193		
Log likelihood		-10789.561			-10789.511			-10205.579			-10205.505			
ln(σ)		6.621 ***			6.621			6.579 ***			6.580 ***			0.012
atanh(ρ)		0.000			0.047			0.000			0.050			0.132
σ		750.379 ***			750.854			719.912 ***			720.365 ***			9.001
ρ		0.000			0.047			0.000			0.050			0.132
Wald test (H ₀ : ρ = 0)		Wald chi2(1) = 0.086, Prob > chi2 = 0.770						Wald chi2(1) = 0.149, Prob > chi2 = 0.699						
LR test (H ₀ : ρ = 0)		LR chi2(1) = 0.100, Prob > chi2 = 0.752						LR chi2(1) = 0.146, Prob > chi2 = 0.703						
No. of observations		4793						4621						

Legend: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 6 Estimation results by cooperative behavior type (satellite broadcasting)

		Conditional cooperators				Unconditional cooperators			
		Restricted model ($\rho=0$)		Unrestricted model		Restricted model ($\rho=0$)		Unrestricted model	
		Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
Eq.1: WTP	WTPF	107.693 ***	19.752	235.159	162.301	38.315 *	20.784	55.739	152.065
	Personal attributes								
	Gender (Female=0)	13.560	21.742	24.343	25.745	57.612 ***	20.807	58.258 ***	21.538
	Age	2.997 ***	0.715	2.425 **	1.018	3.556 ***	0.720	3.494 ***	0.900
	Income (No income=0)								
	Less than 2000 thousand yen	64.953 **	30.476	60.486 *	31.172	38.368	29.207	38.375	29.195
	2000-4000	87.118 **	34.308	77.032 **	36.773	41.790	32.244	41.322	32.483
	4000-6000	59.868	41.802	49.292	44.122	35.477	38.696	35.406	38.682
	6000-8000	11.351	50.239	-9.179	56.809	35.801	45.636	35.430	45.736
	8000-10000	146.593 **	67.111	131.269 *	70.301	65.464	57.650	64.730	57.971
	10000-12000	186.347 *	109.019	174.515	110.853	-18.047	79.358	-21.265	84.090
	12000-15000	39.756	121.771	40.645	122.601	46.496	99.546	48.037	100.417
	15000-20000	78.386	221.602	102.019	224.145	106.807	141.375	108.843	142.346
	Above 20000	665.987 **	288.956	674.573 **	292.827	100.621	176.520	101.447	176.298
	Employment status (employed=0)								
	Homemaker	-14.310	31.189	-15.432	31.397	-0.324	29.810	-1.243	30.831
	Student	66.152	48.280	50.789	52.284	217.577 ***	51.176	216.125 ***	52.685
	Unemployed	18.095	30.429	16.681	30.660	-41.732	27.262	-42.305	27.690
	Evaluation of broadcast content								
	Importance (GTV or BS1)	15.659	13.337	15.460	13.427	23.786 *	12.776	23.867 *	12.789
	Importance (ETV or BSP)	34.316 **	13.663	33.601 **	13.777	26.260 **	13.123	26.163 **	13.144
	Satisfaciton (GTV or BS1)	40.714 **	19.878	40.446 **	19.995	50.474 ***	17.823	50.608 ***	17.850
	Satisfaction (ETV or BSP)	43.680 **	19.720	43.388 **	19.836	21.599	17.756	21.452	17.791
	Total score on 10 indicators	1.090 ***	0.178	0.922 ***	0.277	1.053 ***	0.174	1.037 ***	0.220
	Understanding of fee system								
	Cost of public good	60.287 ***	12.209	50.735 ***	17.209	46.251 ***	14.012	45.336 ***	16.090
	Price of viewing	31.927 ***	11.774	29.144 **	12.360	41.759 ***	13.506	41.280 ***	14.124
	Should be paid by government	-25.888 **	10.772	-24.528 **	10.971	-34.072 ***	10.522	-33.878 ***	10.652
	Hours viewing NHK	36.575 ***	6.809	34.336 ***	7.410	39.764 ***	6.715	39.800 ***	6.716
	Constant term	-203.735 ***	75.648	-203.688 ***	76.052	-44.720	73.483	-49.761	85.427
Eq.2: WTPF	Personal attributes								
	Gender (Female=0)	-0.245 ***	0.059	-0.246 ***	0.059	-0.109 *	0.059	-0.109 *	0.059
	Age	0.013 ***	0.002	0.013 ***	0.002	0.011 ***	0.002	0.011 ***	0.002
	Income (No income=0)								
	Less than 2000 thousand yen	0.100	0.082	0.099	0.082	0.013	0.084	0.014	0.084
	2000-4000	0.233 **	0.093	0.231 **	0.093	0.102	0.093	0.102	0.093
	4000-6000	0.232 **	0.113	0.228 **	0.113	0.029	0.108	0.029	0.108
	6000-8000	0.460 ***	0.136	0.451 ***	0.136	0.069	0.128	0.069	0.128
	8000-10000	0.330 *	0.183	0.334 *	0.183	0.137	0.162	0.137	0.162
	10000-12000	0.251	0.306	0.248	0.303	0.626 **	0.248	0.625 **	0.248
	12000-15000	-0.044	0.326	-0.035	0.326	-0.235	0.271	-0.235	0.271
	15000-20000	-0.532	0.502	-0.541	0.506	-0.337	0.328	-0.337	0.328
	Above 20000	-0.128	0.622	-0.119	0.614	-0.155	0.447	-0.157	0.446
	Employment status (employed=0)								
	Homemaker	0.030	0.086	0.026	0.086	0.181 **	0.087	0.181 **	0.087
	Student	0.342 ***	0.128	0.339 ***	0.128	0.275 **	0.140	0.276 **	0.140
	Unemployed	0.041	0.084	0.045	0.084	0.108	0.078	0.108	0.078
	Evaluation of broadcast content								
	Importance (GTV or BS1)	0.002	0.037	0.003	0.037	-0.017	0.036	-0.017	0.036
	Importance (ETV or BSP)	0.015	0.038	0.015	0.038	0.020	0.037	0.020	0.037
	Satisfaciton (GTV or BS1)	0.013	0.055	0.014	0.055	-0.018	0.050	-0.017	0.050
	Satisfaction (ETV or BSP)	0.006	0.055	0.006	0.055	0.017	0.050	0.017	0.050
	Total score on 10 indicators	0.004 ***	0.000	0.004 ***	0.000	0.003 ***	0.000	0.003 ***	0.000
	Understanding of fee system								
	Cost of public good	0.211 ***	0.033	0.211 ***	0.033	0.146 ***	0.038	0.146 ***	0.038
	Price of viewing	0.063 **	0.032	0.064 **	0.032	0.083 **	0.037	0.083 **	0.037
	Should be paid by government	-0.033	0.029	-0.031	0.030	-0.038	0.030	-0.038	0.030
	Hours viewing NHK	0.052 ***	0.019	0.052 ***	0.019	-0.003	0.020	-0.003	0.020
	Constant term	-1.448 ***	0.204	-1.456 ***	0.204	-0.677 ***	0.207	-0.678 ***	0.207
Log likelihood		-7009.717		-7009.418		-7214.188		-7214.181	
ln(σ)		6.134 ***	0.016	6.142 ***	0.026	6.098 ***	0.015	6.098 ***	0.015
atanh(ρ)		0.000	0.000	0.169	0.214	0.000	0.000	0.024	0.204
σ		461.169	7.285	464.879 ***	11.902	444.858 ***	6.763	444.924 ***	6.861
ρ		0.000	0.000	0.167	0.208	0.000	0.000	0.024	0.204
Wald test ($H_0: \rho = 0$)		Wald chi2(1) = 0.597, Prob > chi2 = 0.440				Wald chi2(1) = 0.013, Prob > chi2 = 0.909			
LR test ($H_0: \rho = 0$)		LR chi2(1) = 0.646, Prob > chi2 = 0.421				LR chi2(1) = 0.013, Prob > chi2 = 0.908			
No. of observations		2998				3251			

Legend: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 7. Predicted WTP and number of observations

	Terrestrial broadcasting			Satellite broadcasting		
	All	Conditional cooperators	Unconditional cooperators	All	Conditional cooperators	Unconditional cooperators
WTPF = 1	1302.9	1097.8	1531.3	866.6	758.3	988.6
	6350	2721	3359	4395	1781	2443
	(64.3%)	(56.8%)	(72.7%)	(67.3%)	(59.4%)	(75.1%)
WTPF = 0	917.7	736.4	1217.9	705.2	611.1	856.2
	3531	2072	1262	2131	1217	808
	(35.7%)	(43.2%)	(27.3%)	(32.7%)	(40.6%)	(24.9%)
Total	1165.3	941.6	1445.7	813.9	698.6	955.7
	9881	4793	4621	6526	2998	3251
	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)