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Validity verification of Mental Accounting in Public Goods Payment

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ABSTRACT

Mental accounting has been applied to explain people's consumption behavior of private goods by categorizing budgets. However, research on mental accounting of public goods payment is scarce. To provide evidence for the existence of mental accounting of public goods payment, we conducted an online experiment by following an approach similar to the classic theater ticket experiment of Tversky and Kahneman, which revealed the existence of mental accounting by positive phrase questionnaire. We used the Hometown Tax and the Resident Tax in Japan as substitutes for theater tickets, and asked respondents' attitudes toward paying the tax by the questionnaire using positive, negative, and normative phrases. Our results were consistent across questionnaire items regardless of tone of the phrases, evincing the existence of mental accounting for the tax payment. Additionally, the results suggest that understanding the tax system may help encourage respondents to pay the tax.

JEL codes: C91, D90, H25, H26

Keywords: Mental accounting, Experiment, Public goods payment, Tax

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1 INTRODUCTION AND LITERATURE REVIEW

1.1 How Mental Accounting Works

Like accountants using accounting as a measurement to record an organization's economic activities, mental accounting is a cognitive operation for people to keep track of their financial activities (Thaler 1999)[3]. Thaler (1999) used the following anecdote to show that this cognitive process plays a role in people's decision making. A couple were spending a week visiting Switzerland after they finished a business trip there. Due to the high prices in Switzerland, they comforted themselves by using the additional bonus of the business trip to Switzerland that they received to cover the private trip expenditures. Thus, they could enjoy the trip more. Thaler (1999) also assumed a comparison between the above anecdote and another anecdote in which only the place where they received the bonus changed. If the couple received the same amount of bonus in New York, their trip to Switzerland would have been less enjoyable. From the standard economics view that assumes the budget is always "fungible," the expenditure remains the same regardless of whether they received the bonus or not, and no matter where they received the bonus. However, mental accounting supports the above anecdote because there existed two different mental accounts: the Switzerland account and the New York account. When the bonus and the expenditure came from the same mental account (the Switzerland account), their calculation incorporated the enjoyment of the private trip.

Existing literature of mental accounting has focused mainly on how mental accounting influences consumption of private goods. Typical consumption behaviors to which mental accounting has been extensively applied are presented as follows. Mental accounting supports that credit card payment would increase consumption by explaining mixed purchases as integrated losses that can reduce the pain of payment (Raghubir and Srivastava 2008). Furthermore, Thomas et al. (2011) used it to accommodate the rapid increase in obesity rate in the United States. The research empirically analyzed households' shopping lists including unhealthy food and the

3. Kahneman and Tversky (1984) proposed a different explanation of mental accounting. They stated that mental accounting is for people to organize the outcomes of transactions.

corresponding mode of payments they found that card payments motivated the consumption of unhealthy food. In addition, by mental accounting, flat-rate pricing plans like monthly fixed charges of phone calls would let people enjoy each service more by reducing the connection between each phone call and its payment (Train 1991). To spend down the principal slowly, mental accounting supports that keeping two respective accounts for dividends and principal would be helpful for investors. Thus, numerous firms prefer paying dividends to cash (Shefrin and Statman 1984). When holding unrealized prior loss, where "realized" means that money or other value is transferred between actual accounts, an investor is said to be engaged in risk seeking (Imas 2016). This is because the investor would like to keep the unrealized prior loss and the outcome of future investment in the same mental account to cover the pain of existing loss. The same argument can be applied to the situation in which an investor has not realized their prior gain (Merkle et al. 2021).

1.2 Mental Accounting and Public Goods Payment

While growing attention has been focused on private goods payment in mental accounting research, there is a dearth of research on public goods payment. Self-employed taxpayers expressed mental segregation of the tax due from revenue by answering open questions about their income tax payment management (Muehlbacher and Kirchler 2013). A relationship of mental segregation of tax due and tax compliance was revealed by a laboratory experiment where respondents played the role of self-employed taxpayers. Under a fixed tax checking rate and tax evasion fine, the respondents needed to finish computer games as "business tasks" and arranged their income tax in each round (Muehlbacher et al. 2017). It is important to note that the participants in these two studies were self-employed taxpayers who are highly sensitive to paying taxes compared to general taxpayers. Thus, the general existence of mental accounting regarding public goods payment requires more evidence.

Several explanations should be considered concerning the small amount of existing mental accounting research on public goods payment. First, diversity of mental accounts makes it hard

to directly study mental accounting. Mental accounts are not only varied in amounts but also diverse in the categorization criteria and frequency. The Switzerland versus New York anecdote indicates that a variety of mental accounts accommodate people's choice to make themselves as happy as possible when evaluating the joint receipt of two separate transactions (Fishburn and Luce 1995). There are multiple criteria for assigning economic activities to mental accounts. Target of expenditures, mode of payments, and time of payments can all be criteria for categorized mental accounts as well as merchandise labels in supermarkets (Thaler 1999).

In terms of frequency, it is possible that some people sum up their account by the week while others by month or year (Read et al. 1999). The process of mental accounting is so personalized that research needs to accommodate mental accounting mainly by observing decision results. However, compared to a clear connection between payment and private goods, a connection between public goods and their payment are ambiguous. Taking tax payment as an example, people are usually not informed about what their tax payment is being used for. Regarding the incentive, people purchase private goods to increase their utility, but contribute to public goods for complex reasons including not only utility but also perception of punishment (i.e. a fine) and moral motivations. Therefore, inferring the effect of mental accounting concerning private goods consumption is more straightforward than for public goods.

Next, in terms of experimental design, it is difficult to examine mental accounting of public goods payment. Tversky and Kahneman (1981) indicated the existence of mental accounting through a survey experiment that asked the respondents' willingness to pay for a theater ticket after they lost the ticket that they had already paid for or lost the money they had set aside for the ticket. However, it is nearly impossible to construct an experiment by simply substituting public goods for a theater ticket to show the effect of mental accounting on public goods payment. Constructing a scenario where people have freedom of choice in paying taxes is also unrealistic. Public goods payments are usually mandatory and involve punishment for non-compliance. If individuals resist paying taxes, the penalty can be double the original amount of tax payment or more. Therefore, it takes some ingenuity to design a new experiment while following the representative studies that showed the existence of mental accounting.

To examine the general existence of mental accounting of public goods payment, we conducted an online survey experiment based on that of Tversky and Kahneman (1981). We focused our experiment on tax payment, as it is the most general public goods payment. We thought that the Hometown Tax system and the Resident Tax reduction in Japan would provide an appropriate substitution for a theater ticket. Residents who pay a Hometown Tax can apply for a Resident Tax reduction by submitting the paper certificate of their Hometown Tax payment within a certain period. Thus, two scenarios in the experiment could be "lost the Hometown Tax payment certificate" and "lost the money set aside for the Hometown Tax payment." Our findings are as follows. First, for both the positive phrase (Question 1) and negative phrase (Question 2) questions, there was a striking difference in the attitude toward paying the Resident Tax among respondents between the two scenarios. Second, participants' willingness to pay the Resident Tax increased while reluctance to pay decreased in both treatments when they understood the tax system. Finally, we found evidence of the existence of mental accounting in the normative phrase question (Question 3). In the following parts, the experiment design and hypotheses are introduced in Section 2, results are shown in Section 3, and our conclusion and further discussion are presented in Section 4. We hope our study will support development of the application of mental accounting in public goods payment and contribute to continuous endeavor in extending the validity of mental accounting theory.

2 EXPERIMENT DESIGN AND HYPOTHESES

2.1 Method

To investigate whether mental accounting applies concerning public goods payment, this study followed the experiment constructed by Tversky and Kahneman (1981) in respect of the real tax system, the Hometown Tax, and the Resident Tax reduction, in Japan. The "down-to-earth" situation that is realistic enough to be engaging to the participants is necessary for this kind of thought experiment because people's intuition is unreliable if guided by unrealistic descriptions

that inflate their expectations. Their decision making could be far beyond their true preference[4].

2.2 Procedure

We conducted an online survey type experiment using Qualtrics in accordance with approved guidelines by the Waseda University Ethical Review Board in February 2022. Six hundred and fifty-one respondents anonymously filled out the survey through their Yahoo! JAPAN accounts for a monetary reward. They needed to answer a questionnaire in Japanese composed of three parts. The first part involved the explanation of the Hometown Tax and the Resident Tax reduction. To test whether respondents understood the tax system, we added a single-choice questionnaire item about calculating the reduction amount. The explanation part was followed by the main part of the experiment which consisted of two treatments: a lost receipt and lost tax money. The last section contained demographic items including past experiences of paying the Hometown Tax, income, age, gender, education, and occupation. The respondents were allowed to exit the online questionnaire anytime but monetary rewards were only provided to those respondents who completed the whole questionnaire.

2.3 Kahneman and Tversky's Experiment

Tversky and Kahneman (1981) explained the existence of mental accounting via a survey experiment that asked the respondents' willingness to pay for a theater ticket after they lost the ticket they had already paid for or lost the money set aside for the ticket. The original description of the two scenarios and the question corresponding to each scenario is as follows.

The situation of lost money*: Imagine that you have decided to see a play where admission is $10 per ticket. As you enter the theater you discover that you have lost a $10 bill. Would you still pay $10 for a ticket for the play?*

The situation of lost ticket*: Imagine that you have decided to see a play and paid the*

4. Dennett (2015) pointed out that thought experiments like the Twin Earth experiment, the Chinese room experiment, etc. were "intuition pumps." He criticized that such thought experiments with highly imaginative assumptions could lead respondents to unwarranted conclusions.

admission price of $10 per ticket. As you enter the theater you discover that you have lost the ticket. Theseat was not marked and the ticket cannot be recovered. Would you pay $10 for another ticket? Three hundred and eighty-three students from Stanford University and the University of British Columbia responded to the questionnaires offline. Standard economic theory predicts that people do not change their willingness to pay in both scenarios, but the result showed a radical difference between the two scenarios. The result of their experiment is illustrated in Table 1. The difference in the distribution of answers between these two scenarios indicated the existence of mental accounting. In the lost ticket scenario, the price of the lost ticket had already entered the mental account of the play. Another ticket would make the respondents more likely to consider the ticket price to be doubled. However, the ticket price would remain unchanged from the respondents' consideration in the lost money scenario since the lost money had yet not been specifically linked to the ticket.

TABLE 1
Results of Tversky and Kahneman's Experiment

SITUATION	NUMBER OF SUBJECTS	PERCENTAGE OF YES	PERCENTAGE OF NO
Lost money	183	88	12
Lost ticket	200	46	54

2.4 Hometown Tax and Tax Reduction in Japan

To create a pertinent questionnaire, the key is to find a kind of public goods payment that can replace the role of the ticket in the experiment of Kahneman and Tversky (1981). To this end, we introduce the Resident Tax and the Hometown Tax system in Japan, which we consider to be an appropriate substitute for the ticket of Kahneman and Tversky (1981).

The Resident Tax in Japan is a system requiring residents to broadly share the expenses necessary for administrative services with a rate of 10% based on their annual income.

The Hometown Tax in Japan is a tax system that allows taxpayers to voluntarily contribute to rural areas of their choice. In return, taxpayers who contribute more than 2,000 yen for the Hometown Tax are entitled to a reduction in income tax and the Resident Tax. To apply for the reduction, the taxpayer needs to submit a final tax return with the receipt of the Hometown Tax

payment beforethe deadline. The deducted amount is the taxpayer's total contribution minus 2,000 yen. The amount of reduction of the Resident Tax is composed of two parts.

The first is the basic part:

$$Reduction_b = \text{Resident Tax rate} \times (\text{Hometown Tax} - 2{,}000 \text{ yen})$$

The second is the special part:

$$Reduction_s = (100\% - \text{Resident Tax rate} - \text{Income Tax rate}) \times (\text{Hometown Tax} - 2{,}000 \text{ yen})$$

For the amount income reduction:

$$Reduction_i = \text{Income Tax rate} \times (\text{Hometown Tax} - 2{,}000 \text{ yen})$$

For example: if an income tax rate of 23% is imposed on a taxpayer, and he/she has already paid 5,000 yen for the Hometown Tax and successfully applied for tax reduction, then the Resident Tax reduction follows:

$$10\% \times (5{,}000 - 2{,}000) + (100\% - 10\% - 23\%) \times (5{,}000 - 2{,}000) = 2{,}310 \text{ yen}$$

Income Tax reduction:

$$23\% \times (5{,}000 - 2{,}000) = 690 \text{ yen}$$

In addition to the reduction, the Hometown taxpayers can also receive items as a gift. These items are usually homegrown specialties of the region that are often difficult to find anywhere else. The gift can be regarded as an incentive for people to join the Hometown Tax system since the regular selling price of the same gift purchased in the local mall is usually more than 2,000 yen.

Given the situation above, it is possible that people could lose their receipt for the Hometown Tax payment or the amount of money set aside for the Hometown Tax, and hence lose the chance forapplying for a tax reduction. Thus, the treatments that equate to that used by Kahneman and Tversky (1981) but related to public goods payment are appropriate.

2.5 Treatment

Two treatments, the lost receipt and lost tax money treatments, were established and participants were randomly assigned to answer questions in one of the treatments. For the full questionnaire,

please refer to Appendix A[5]. In this section we describe the details of the two treatments. Each treatment was expected to have around 300 participants (See Table 2).

TABLE 2
Treatments and Number of Participants

TREATMENTS	SIZE	MALE	FEMALE
Lost receipt	328	200 (60.98%)	92 (28.05%)
Lost tax money	323	198 (61.30%)	86 (26.63%)

Note: *In the lost receipt and lost tax money treatments, two and one respondents refused to reveal their gender, and 34 and 38 respondents stopped filling the questionnaire before the question regarding gender, respectively.*

Lost receipt treatment: Respondents were asked to imagine that they had already paid 30,000 yen for the Hometown Tax through a printed application, and they had received the receipt. However, on the last day of the period allowed to apply for the Resident Tax reduction, on the way to the tax office, they found that they lost the receipt which is indispensable for the application for the Resident Tax reduction. As it was the last day for the tax reduction application, there is no time left to reapply with the receipt.

Lost tax money treatment: Respondents were faced with a similar predicament to those with the lost receipt treatment except for one element. The respondents wanted to pay the Hometown Tax of 30,000 yen through a printed application but lost the money on their way to the bank. As it was the last day for sending the money and the time for the tax office to close was approaching, they have insufficient time to prepare another 30,000 yen to pay for the Hometown Tax.

In both treatments, a 10% discovery rate of tax evasion and a 100% penalty of the evasion amount were assumed[6]. After reading the scenario, the respondents were required to answer the following three questions.

Question 1: To what extent are you willing to pay the resident tax in full?

The respondents were asked to indicate their extent of willingness to pay the Resident Tax in the full amount on a scale with range 0–100. Examples of item with corresponding values follow: "I have zero intention of paying, not even one yen," 0; "Of course, I am willing to pay the

5. The English version of the questionnaire.
6. The 10% discovery rate of tax evasion and the 100% penalty of the evasion amount correspond to the setting in Muehlbacher et al. (2017).

full amount," 100.

Question 2: What percentage of your Resident Tax don't you want to pay?

The respondents were asked to indicate their unwillingness to pay the Resident Tax as a percentage. For example, if they were unwilling to pay 47% of the Resident Tax, they wrote 47.

Question 3: What percentage of your Resident Tax do you think you should pay?

The respondents were also asked to indicate the extent of obligation they feel toward paying the Resident Tax as a percentage. For example, if they felt obligated to pay 61% of the Resident Tax, they entered 61.

Questions 1 and 2 were used to reflect the respondents' willingness to pay and their reluctance to pay the Resident Tax, respectively. To balance the effect of the positive and negative phrases on the choices of the respondents, these two questions were asked in reverse. Question 3 focused on people's sense of obligation rather than their attitude toward the tax payment. If we were able to observe the existence of mental accounting in Question 1 (positive phrase), Question 2 (negative phrase), and Question 3 (normative phrase), we should be able to conclude that the mental accounting exists in a public goods payment case, such as in the payment for the Resident Tax[7].

2.6 Hypotheses

If the respondents successfully applied for the Resident Tax reduction regardless of whether they are in the lost receipt or the lost tax money treatment, the amount they need to pay for the Resident Tax is the same:

$$\text{Resident Tax amount} = \text{Original Resident Tax amount} - \text{Reduction amount}$$

where

7. To simplify our questionnaire, we did not consider the gift in the treatments. This is because, from the standard economics view, when respondents are asked if they pay the Resident Tax, they are risk-neutral and have no incentive other than maximizing their own payoffs with constant marginal utility. Thus, we think that their decision about the Resident Tax payment has nothing to do with the gift received in the future even though the one who lost the receipt would receive the gift and another who lost the money would not. Also, from the mental accounting view, the gift is not a variable affecting their decision to pay the resident tax. Similarly, the obligation for paying Income Tax is generally understood by taxpayers; therefore, we only considered the willingness to pay for the Resident Tax in our experiment.

Reduction amount = 10% × (30,000 − 2,000) + (100% − 10% − Income Tax rate) × (30,000 − 2,000)

= 28,000 × (100% − Income Tax rate)

This is because when the respondents are in the lost receipt treatment, they would lose the chance to apply for the Resident Tax reduction, and this applies equally to participants in the lost tax money treatment. Thus, the amount they needed to pay for the Resident Tax was the same as the original amount.

If mental accounting applies to public goods payment, the willingness to pay the Resident Tax would be greater on average in the lost tax money than in the lost receipt treatment. This is because respondents in the lost receipt treatment had already paid the 30,000 yen specifically linked to their Resident Tax account. Thus, we generated the following hypotheses:

Hypothesis I: Respondents in the lost receipt treatment are less willing to pay the Resident Tax.

Question 2 was prepared to verify whether people's mental accounting of public goods payment would not be affected by the negative phrase. Hence, Hypothesis II does not essentially differ from Hypothesis I:

Hypothesis II: Respondents are more reluctant to pay the Resident Tax in the lost receipt treatment than in the lost tax money treatment.

Finally, it is possible that taxpayers may be keenly aware of their responsibility to pay the Resident Tax regardless, due to the law. In other words, any mental accounting effect might be weakened or disappear when the respondents' sense of obligation in paying the Resident Tax is considered. As we could not predict if the sense of obligation is strong enough to negate the existence of mental accounting, Hypothesis III should be considered as explanatory:

Hypothesis III: In the normative phrase (Question 3), respondents may show the existence of mental accounting.

3 RESULTS

3.1 Profile of Respondents

As stated in the previous section, 651 respondents participated in the online experiment. Some respondents dropped out before completing the questionnaire and some uploaded multiple submissions; responses were only included in the statistical analysis if they at least had the introduction and the main part of the questionnaire complete[8]. Consequently, our sample consisted of the following: lost receipt treatment (n = 256), 171 males, 83 females, and two who refused to reveal their gender; and lost tax money treatment (n = 241), 166 males, 74 females, and one who refused to reveal their gender (See Table 3).

TABLE 3
Profile of Valid Respondents

TREATMENTS	SIZE	MALE	FEMALE
Lost receipt	256	171 (66.80%)	83 (32.42%)
Lost tax money	241	166 (68.88%)	74 (30.71%)

Note: *In the lost receipt and lost tax money treatments, two and one respondents refused to reveal their gender, respectively.*

3.2 Descriptive Statistics of Main Dependent Variables

In this experiment, three main questions were used as dependent variables: willingness to pay, reluctance to pay, and sense of obligation for making the payment. We aimed to comprehensively examine the validity of mental accounting of public goods payment from the following three aspects between the two treatments.

3.2.1 Willingness and Reluctance to Pay

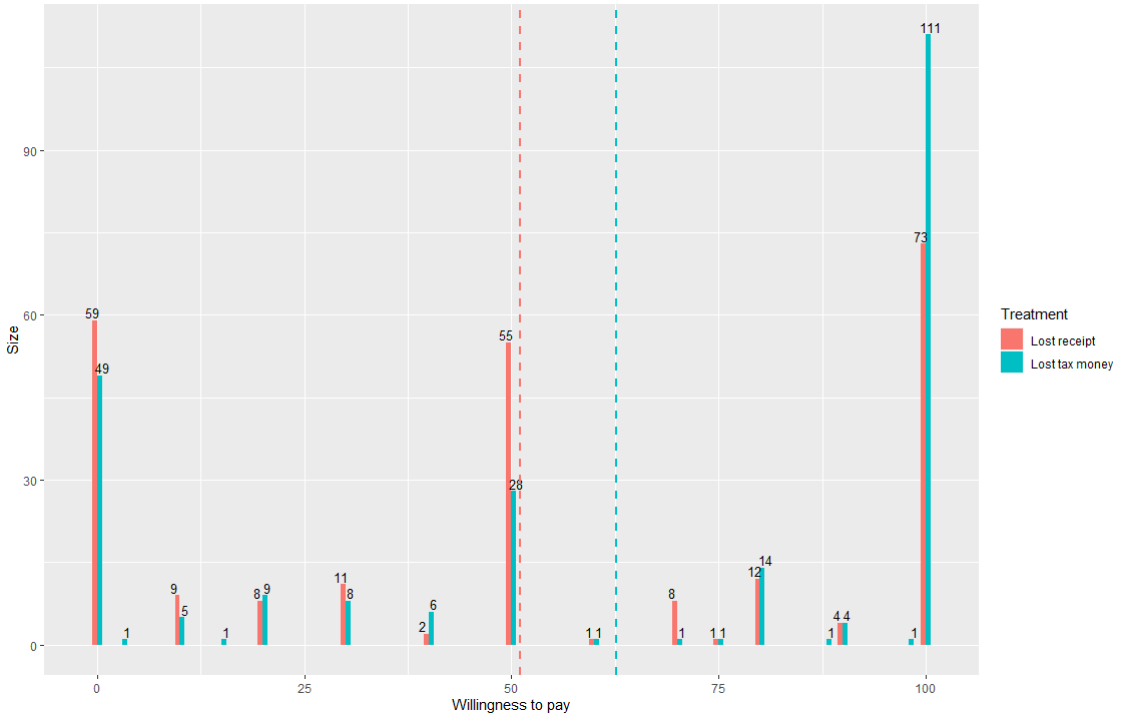
In the first two questions, we asked the respondents' attitude toward the Resident Tax payment in two different ways. Question 1 directly asked them their willingness to pay, while Question 2 asked the question in reverse, as reluctance to pay. Both questions were open questions and required respondents to indicate the extent that each item applied to themselves with a value on a scale with range 0–100. In Question 1, the greater the value, the more willing the respondents are

8. For detail of filtering, please refer to Appendix B.

to pay the full Resident Tax. In Question 2, the greater the value, the more reluctant the respondents are to pay the Resident Tax.

The mean of willingness to pay in the lost receipt treatment was 51.00. The willingness to pay among 0 (23.05%), 50 (21.48%), and 100 (28.52%) was equally distributed, accounting for two-thirds of the responses. For the lost money treatment, the mean of willingness to pay was 62.65, and nearly half of the respondents (46.06%) gave 100 as the answer. The distribution of willingness to pay among the two treatments is shown in Figure 1.

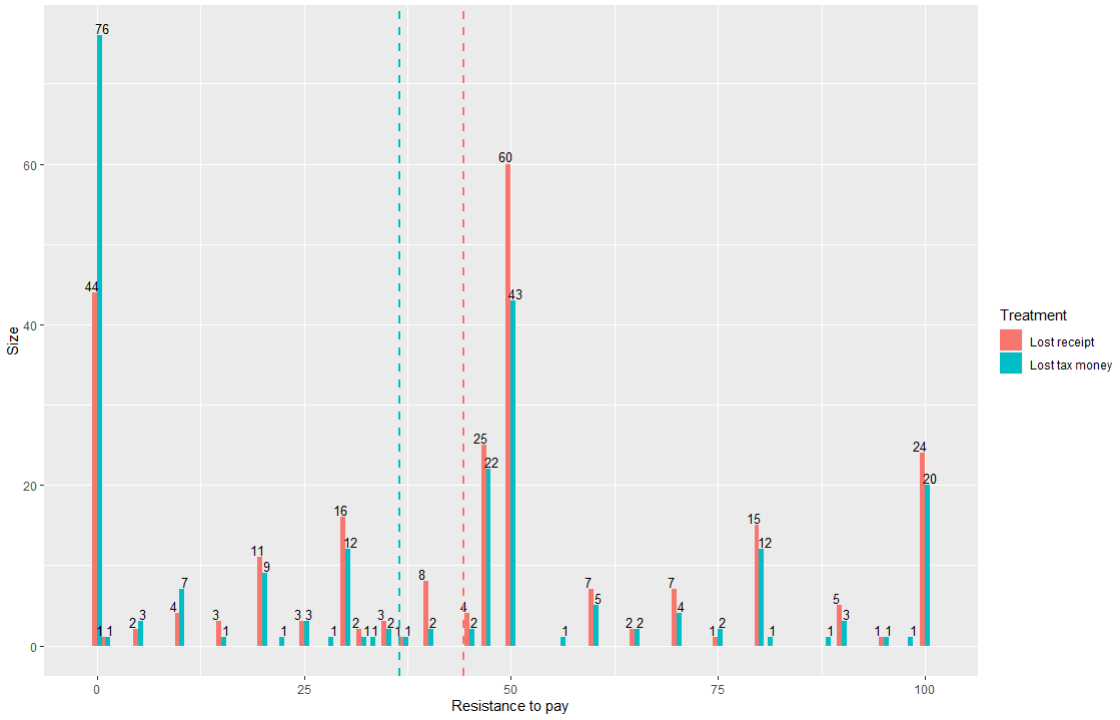
FIGURE 1
The Distribution of Willingness to Pay



Note: The dotted lines represent the mean in treatments.

Responses concerning reluctance to pay also showed a different distribution between the two treatments. For the lost receipt treatment, the distribution of reluctance to pay was scattered with a mean of 44.23. The largest proportion of the responses was 50, given by 60 (23.44%) respondents. For the lost tax money treatment, the mean value was 36.50. Nearly one-third expressed no reluctance (31.54% answered 0). The distribution of the reluctance to pay is presented in Figure 2.

FIGURE 2
The Distribution of Reluctance to Pay



Note: The dotted lines represent the mean in treatments

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For answers to Questions 1 and 2, the Shapiro–Wilk test had $P < 0.001$ (See Table 4). Thus, the distribution of willingness to pay and reluctance to pay departed significantly from normality in both treatments. Because a *t*-test was not appropriate for testing the difference in willingness to pay and in reluctance to pay between the two treatments, we conducted the Mann–Whitney U test. This showed significantly less willingness to pay for the lost receipt compared to the lost tax money treatment ($W = 25850$, $N_{S1} = 256$, $N_{S2} = 241$, $P < 0.001$, one-sided; See Table 5). Reluctance to pay was significantly stronger in the lost receipt than in the lost tax money treatment ($W = 35344$, $N_{S1} = 256$, $N_{S2} = 241$, $P = 0.002$, one-sided; See Table 5). These results are consistent with both Hypotheses I and II.

TABLE 4
Shapiro–Wilk Test Results

TREATMENT	SHAPIRO–WILK	WILLINGNESS TO PAY	RELUCTANCE TO PAY	SENSE OF OBLIGATION
Lost receipt	W-value	0.84616	0.91818	0.90735
	P-value	3.042e-15	1.215e-10	1.783e-11
Lost tax money	W-value	0.76948	0.87524	0.85144
	P-value	2.2e-16	3.775e-13	1.803e-14

TABLE 5
Mann–Whitney U Test Results

MANN–WHITNEY U TEST	WILLINGNESS TO PAY	RELUCTANCE TO PAY	SENSE OF OBLIGATION
Type: one-sided	less	greater	less
W-value	25850	35344	25892
P-value	0.0006149	0.002219	0.0007788

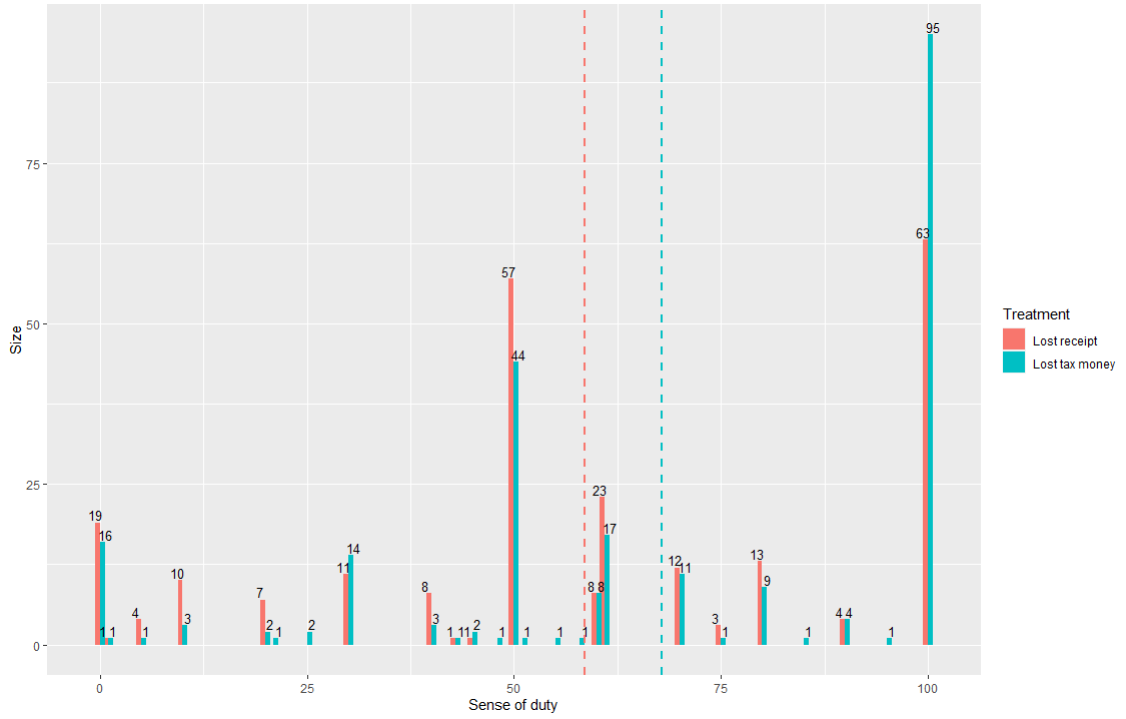
Note: This test compared the distribution difference of the respondents in the lost receipt treatment (S1) with the respondents in the lost money treatment (S2).

Based on responses to Questions 1 and 2, we included willingness to pay and reluctance to pay as dependent variables. To measure mental accounting of public goods payment, we compared the distribution of these two dependent variables between the two treatments.

3.2.2 Sense of Obligation for the Payment

Another dependent variable included was the sense of obligation. Question 3 intended to examine the effect of mental accounting on people's sense of obligation to pay the Resident Tax. It was also an open question that required the respondents to indicate their sense of obligation with a value on a scale with range 0–100. A greater value corresponds to a higher sense of obligation of respondents.

FIGURE 3
The Distribution of Sense of Obligation



Note: The dotted lines represent the mean in treatments

For the lost receipt treatment, the mean was 58.56. About 25% of the respondents indicated their complete obligation or sense of obligation (answer 100) for paying the Resident Tax. For the lost tax money treatment, the average value given in the obligation scale was 67.86 while about 40% of the respondents entered 100 as their response. The distribution of the sense of obligation for paying tax is shown in Figure 3.

Since results of the Shapiro–Wilk test indicated that the sense of obligation departed significantly from normality (for the lost receipt treatment, $W = 0.90735$, $P < 0.001$; for the lost tax money treatment, $W = 0.85144$, $P < 0.001$; See Table 4), the Mann–Whitney U test was used to test the difference in sense of obligation between treatments. The results revealed that the sense of obligation was significantly less for the lost receipt than the lost tax money treatment ($W = 25892$, $N_{S1} = 256$, $N_{S2} = 241$, $P < 0.001$, one-sided; See Table 5). Thus Hypothesis III was supported.

3.3 Regression Analysis

We conducted multiple regression to examine the existence of mental accounting in a more rigorous manner. To clarify the effect of mental accounting on willingness to pay, reluctance to pay, and sense of obligation, we applied multiple regression using the dependent variables from the questionnaire. Since some respondents declined to report their household income, only the 414 respondents who provided the complete demographic profile were included, to ensure accuracy of the regression analysis. The distribution of their responses was same as that of the valid responses shown in the previous section.

In the model, we set “Treatment” as a dummy variable, where 1 represented the lost receipt treatment and 0 represented the lost tax money. “Don’t understand” and “Frequency” were also used as dummy variables. For “Don’t understand” response, 1 denoted that the respondents did not correctly calculate the reduction amount in the introduction part of the questionnaire. For “Frequency” response, 1 indicated that the respondents had paid the Hometown Tax at least once and 0 indicated they had no such experience. Control variables were “Age,” “Annual household income,” and “Last academic background.”

3.3.1 Existence of Mental Accounting

The regression results are given in Table 6. For all dependent variables, the treatments had a significant effect. Compared to the lost tax money treatment, respondents in the lost receipt treatment were 15.16% less willing to pay the full Resident Tax on average. Thus Hypothesis I was supported. For the negative phrase question, the respondents also showed significant mental accounting and so Hypothesis II was also supported. They were 13.88% more reluctant on average to pay the Resident Tax for the lost receipt than the lost tax money treatment. Thus, the existence of mental accounting in the Resident Tax payment was confirmed.

TABLE 6
Regression Results

	WILLINGNESS TO PAY			**RELUCTANCE TO PAY**			**SENSE OF OBLIGATION**		
PREDICTORS	*ESTIMATES*	*STD. ERROR*	*P-VALUE*	*ESTIMATES*	*STD. ERROR*	*P-VALUE*	*ESTIMATES*	*STD. ERROR*	*P-VALUE*
(Intercept)	64.479	12.579	**<0.001**	47.226	10.075	**<0.001**	65.79	9.994	**<0.001**
Don't understand	−22.974	5.603	**<0.001**	14.269	4.488	**0.002**	−15.814	4.452	**<0.001**
Treatment	−15.156	5.572	**0.007**	13.877	4.463	**0.002**	−9.709	4.427	**0.029**
Don't understand × Treatment	6.085	7.713	0.431	−8.68	6.178	0.161	−1.563	6.128	0.799
Gender Male	0.277	4.384	0.95	−3.446	3.511	0.327	−4.374	3.483	0.21
Age	2.098	1.818	0.249	−2.726	1.456	0.062	2.375	1.445	0.101
Annual household income	−0.632	0.796	0.428	0.696	0.637	0.275	−0.703	0.632	0.267
Highest education level	0.842	1.905	0.659	−1.608	1.526	0.293	1.591	1.514	0.294
Frequency	0.622	4.047	0.878	−2.548	3.241	0.432	0.234	3.215	0.942
Observations		414			414			414	
R^2 / R^2 adjusted		0.092 / 0.075			0.073 / 0.054			0.114 / 0.096	
AIC		4215.584			4031.796			4025.127	

Note: Annual individual income was also non-significant if substituted for annual household income.

Sense of obligation was also significantly influenced by mental accounting. In the lost receipt treatment, the amount the respondents thought that they should pay for the Resident Tax was 9.71% less on average than in the lost tax money treatment, thereby satisfying Hypothesis III. In conclusion, the existence of mental accounting for the Resident Tax was robust across phrases.

3.3.2 Another Finding

In addition, whether the respondents understood the tax system in the experiment had a significant effect on the dependent variables. Compared to those who selected the correct deduction amount, the respondents who provided an incorrect amount had less willingness to pay, a lower sense of obligation, and a greater reluctance to pay. In other words, enhancing understanding of the tax system could help the respondents become more tax compliant.

4 CONCLUSION AND DISCUSSION

This study reviewed how mental accounting accommodated people's consumption behaviors and summarized the reasons why research focusing on public goods payment in mental accounting is scarce. Inspired by the classic experiment of Tversky and Kahneman (1981), which indicated mental accounting through observation of the difference in willingness to pay for a theater ticket under two scenarios, we attempted to substitute public goods payment for the theater ticket while keeping the "down-to-earth" characteristic. By taking advantage of the Hometown Tax system and the Resident Tax reduction in Japan, we conducted our experiment with an online questionnaire to ensure sufficient sample size.

In our experiment, the respondents were randomly assigned to two treatments regarding the Hometown Tax system and the Resident Tax reduction: one condition concerned a lost receipt and the other involved lost tax money. In both treatments, the respondents lost the chance to apply for the Resident Tax reduction and needed to answer three main questions regarding their willingness to pay, reluctance to pay, and sense of obligation about the payment. The distribution of answers to these three questions significantly differed between the two treatments. Compared to the lost tax money treatment, respondents in the lost receipt treatment were less willing to pay the full Resident Tax, and the percentage that they were unwilling to pay was higher. Furthermore, in the normative phrase condition (the question about the sense of obligation), the respondents also showed a consistent difference between the two treatments. Hence, we confirmed the existence of mental accounting for public goods payment in our experiment. In addition, if the respondents understood the tax system well, their attitude toward paying the tax became slightly

more positive. This increase in their positive attitude toward making the tax payment was reflected in their increased willingness, reduced reluctance, and enhanced sense of obligation. This result may help policy makers in formulating effective plans of action to increase citizens' tax compliance.

However, there are some limitations to our study. First, conducting the same experiment in other countries, where the Hometown Tax system does not exist, will be difficult. Second, since we used the tax payment as the object in our experiment, it is necessary to verify if mental accounting exists in other categories of public goods payment.

To overcome the restrictions and to further extend the validity of mental accounting to public goods payment, several methods should be considered in further research. By finding specific public goods payment pairs[9], and keeping the main questions, still targeted at the willingness to make the tax payment, we may conduct an appropriate experiment and extend the validity of mental accounting to public goods payment outside of Japan. Next, public goods payment may result in different mental account assignments based on specificity of the objectives. For example, medical insurance payment is assigned with a category that is highly linked to the payment of medical expenditure even if it is for some uncertain medical services in the future, hence it may be assigned to a specific mental account, i.e. health. Furthermore, the validity of mental accounting may be strongly supplemented by the field data verification using big data. Prelec and Loewenstein (1998) indicated that individuals had different preferences of payment type for different merchandise due to "double entry" mental accounting. If the data show a self-employed person, paying annuity annually but making monthly insurance payments, this may suggest different mental accounts for annuity and insurance.

Despite limitations, this study is a step forward in examining the mental accounting of public goods payment that provides experimental evidence of how mental accounting affects people's attitude toward public goods payment.

[9] For example, in the United States, tax credits for purchasing energy efficient appliances are implemented within a specified application period. This is assumed to be similar to scenarios concerning "lost the certificate of the appliance" and "lost the money."

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A APPENDIX: THE QUESTIONNAIRE

A.1 The Introduction Part

The Hometown Tax system in Japan allows taxpayers who live in urban areas to contribute to rural areas in return for a credit from Income Tax and Residence Tax. Taxpayers who contribute more than 2,000 yen can have their Income Tax and Residence Tax reduced. The amount deducted is the taxpayer's entire contribution minus 2,000 yen. To apply the subtraction, the taxpayer files a final tax return with the receipt of Hometown Tax payment before the 15th March in the next year (a receipt is not necessary if paying Hometown Tax online). The amount of reduction of the Resident Tax includes basic and special parts. If the annual income of a single person is five million yen and the Hometown Tax amount is assumed to be 30,000 yen, then the basic part of the Resident Tax reduction follows:

$$Reduction_b = \text{Resident Tax rate } 10\% \times (\text{Hometown Tax } 2{,}000 \text{ yen}) = 2{,}800 \text{ yen}$$

and the special part is:

$$Reduction_s = (100\% - \text{Resident Tax rate } 10\% - \text{Income Tax rate}) \times (\text{Hometown Tax } 2{,}000 \text{ yen})$$

Assuming the Income Tax rate is 10%, how much is the reduction amount in the special part?

1. 22,100 yen
2. 22,200 yen
3. 22,300 yen
4. 22,400 yen
5. 22,500 yen

A.2 The Main Part

A.2.1 Lost Receipt Treatment

Assume that you have already paid Hometown Tax of 30,000 yen through a printed application, and have received the receipt. Because of your busy life, you choose to come to the taxation bureau to apply for the Resident Tax reduction on the last day of application period. However, you find you have lost the receipt, which is necessary to apply for the Resident Tax reduction. Also, since

this is the last day, there is insufficient time to reapply for a receipt. Therefore, you need to pay full Resident Tax. You notice that the checking rate of tax evasion is 10%, and the penalty of tax evasion is 100% of your evaded tax.

Question 1

To which extent will you still want to pay the full Resident Tax?

For example, 0 stands for "I have zero intention of paying, not even one yen" and 100 stands for "Of course, I am willing to pay the full amount."

Question 2

What percentage of your Resident Tax don't you want to pay?

For example, if you were unwilling to pay 47% of the Resident Tax, please enter 47.

Question 3

What percentage of your Resident Tax do you think you should pay?

For example, if you think you should pay 61% of the Resident Tax, please put 61.

A.2.2 Lost Tax Money Treatment

Assume you want to pay Hometown Tax of 30,000 yen through a printed application, and you lost the 30,000 yen on the way to the bank. Because of your busy life, this was the last day to send the money, which means you have lost the chance to apply for the Resident Tax reduction. Therefore, you need to pay the full Resident Tax. You notice that the checking rate of tax evasion is 10%, and the penalty of tax evasion is 100% of your evaded tax.

Question 1

For example, 0 stands for "I have zero intention of paying, not even one yen" and 100 stands for "Of course, I am willing to pay the full amount."

Question 2

What percentage of your Resident Tax don't you want to pay?

For example, if you were unwilling to pay 47% of the Resident Tax, please enter 47.

Question 3

What percentage of your Resident Tax do you think you should pay?

For example, if you think you should pay 61% of the Resident Tax, please put 61.

A.3 The Demographic Part

Gender

Male/Female/Others

Age

10s/20s/30s/40s/50s/60s/70s/80s or older

Experience regarding the Hometown Tax

Used it many times

Used it several times

Used it only once

Never used it

Occupation

Middle school student High school student

Prospective college student (including those currently attending a preparatory school for a college entrance examination)

Vocational college student College student

Regular employee

Contract employee or temporary employee

Part-time employee

Self-employed (including small business owners and freelancers)

Housewife Unemployed

Other

Household income (annual)
Individual income (annual)

Less than 200 million yen

More than 200 million yen and less than 300 million yen

More than 300 million yen and less than 400 million yen

More than 400 million yen and less than 500 million yen

More than 500 million yen and less than 600 million yen

More than 600 million yen and less than 700 million yen

More than 700 million yen and less than 800 million yen

More than 800 million yen and less than 1000 million yen

More than 1000 million yen and less than 1500 million yen

More than 1500 million yen and less than 2000 million yen

More than 2000 million yen and less than 3000 million yen

More than 3000 million yen

Highest education level

Primary school

Middle school

High school

Vocational college

Bachelor

Master

Doctorate

Other

Knowledge of economics

Graduated from an economics faculty

Learned economics before but did not graduate from an economics faculty

Never learned economics before

B APPENDIX: DATA FILTERING LOGIC

TABLE 7
Data Filtering Logic

Type	Size	Reason for invalidation
Spam response	2	Same data exist for the same IP address and all answers are the same
Abnormal	94	Chose the wrong year or wrong month
	58	Randomly filled the questionnaire
Incomplete	83	Refused to select the household income scale

Note: The original size is 651, and the size of each filter is conditioned by all the filters above.