The Effect of Altruism on Consumer Behavior in Japan: an Analysis on Rice Consumption using Scanner Data

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1. Introduction

A number of firms have a rich history of corporate social responsibility (CSR). Over the years, many firms have been trying to increase their value through CSR activity, and in many cases, they have been successful. Some firms have acquired new customers through cause marketing (Kotler and Lin (2006)).

If someone buys private goods affiliated to public goods, he or she might provide a public service by purchasing the private goods. The sale of private goods that provide a positive externality to society has markedly risen in recent years (Lusk et al. (2006)). These facts demonstrate the potential of altruism existing in consumer behavior.

A number of literature have discussed the relationship between altruism and the supply of public goods (e.g., Andreoni (1990); Anderson et al. (1998); Hindriks and Pancs (2002)). Some of the findings reveal that high levels of altruism could lead to an increasing supply of public goods.

A few empirical literatures have dealt with the relationship between altruism and the purchase behavior of commercial goods (e.g., Hamilton (2003); Sunding (2003)). Lusk et al. (2006) conducted choice experiments on pork consumption and examined the effect of altruism on consumer behavior. They identified more altruistic consumers as having a higher willingness to pay for pork products with public good attributes than less altruistic individuals. Umberger et al. (2009) estimated the probit function of the willingness to purchase and pay for beef products and found that consumer preferences for natural and regionally produced beef are motivated by personal benefits and altruistic factors.

These empirical literatures surveyed the consumers' attitudes toward food consumption in detail and estimated a behavioral model combining attitudinal and stated preference (SP) data. However, it has often been suggested that SP data might carry some bias (Mitchell and Carson (1989)).

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Arnot et al. (2006) estimated a conditional logit model using the revealed preference (RP) data of cups of freshly brewed coffees and found that fair trade coffee exhibits lower own-price elasticity than similar conventional products. However, they did not directly evaluate the effect of consumer attitudes because of the lack of consumer-attitude data.

This paper examines the effect of consumer altruism on rice consumption in Japan, by analyzing single-source data consisting of scanner data and detailed questionnaire data. The scanner data was revealed preference data and recorded the real consumer purchase history. The questionnaire data contained information on the consumers' attitudes toward food consumption and detailed demographics.

The paper is organized as follows: the second section describes the data; the third includes a description of consumer attitudes toward food consumption; the fourth reports the major results; and the fifth section highlights the final considerations and conclusions.

2. Data

This paper analyzes the demand for rice by member households of the Pal System Co-op in Japan. We divide the rice consumption into various groups according to the farming method used. The definitions of the groups are listed in Table 1.

Table 1. Definitions of different types of rice

Type of rice	Definition
Ordinary rice	Rice cultivated using the regular method
Eco-friendly rice	Pesticide and chemical fertilizer usage is less than that used in the regular method
Organic rice	Pesticide and chemical fertilizer usage is nil; this rice is Japanese Agricultural Standard (JAS) certified.

Source: Pal-System Co-op data

The data analyzed in this paper uses single-source data that contains the purchase history and questionnaire data. The purchase history data contains information on the households' weekly rice purchases at the co-op from the first week of October 2007 up to the second week of December 2009; the questionnaire data comprises the attitude of

food consumption and the socioeconomic and demographic characteristics of the households. Observations have been aggregated to an annual average data in order to control the large number of zero observations. The final sample covers 1,632 households, after excluding those that are missing information on important variables and those not reporting the purchase records of February and July 2009.

The demographic variables include household size (i.e., the number of household members), age of co-op member, average expenditure per month across 12 categories (less than 100 thousand yen, 100 thousand–150 thousand yen, 150 thousand–200 thousand yen, 200 thousand–250 thousand yen, 250 thousand–300 thousand yen, 300 thousand–350 thousand yen, 350 thousand–400 thousand yen, 400 thousand–500 thousand yen, 500 thousand–600 thousand yen, 600 thousand–800 thousand yen, and over 800 thousand yen), and dummy variables for the lifecycle phase of a household (i.e., a single household, a family that has never nurtured children, a family with children, and a family with children above the age of 18 years.) (Table 2).

Table 2. Demographic variables

Variable	Definition
age	age of the co-op member in the household
membership period	the length of membership with the co-op
income	household income (12 categories)
size	the number of household members
single	if the household comprises a single member, the value is 1; otherwise, 0
a married couple without children	if the household comprises a married couple who do not have children, the value is 1; otherwise, 0
a couple whose children are now adults	if the household comprises a married couple who had finished nurturing all their children, the value is 1; otherwise, 0

From among the rice consuming households, the mean annual amount of rice purchased at the co-op is 659.7 yen for Organic rice, 9,339.5 yen for Eco-friendly rice, and 6,552 yen for Ordinary rice (Table 4). The average price of rice is 3,019.5 yen/5kg for organic rice, 1,935.7 yen/5kg for Eco-friendly rice, and 1,814.9 yen/5kg for ordinary rice (Table 3).

The zero-purchase households for the three product groups are shown in Table 4. In all, 38.7% and 40.3% of the households are zero-purchase households for Organic and Eco-friendly rice, respectively. Thus, the share of zero-purchase households for Organic rice is large.

Table 3. Average price and price ratio to Ordinary rice

	Average price (yen/5kg)	Price ratio to Ordinary rice[1]
Ordinary rice	1,814.9	–
Eco-friendly rice	1,935.7	106.7%
Organic rice	3,019.5	166.4%

1) Comparison with the same origin and variety conditions

Table 4. Average annual purchase quantity and ratio of zero consumption

	Average annual purchase quantity (yen)	Ratio of zero consumption households
Ordinary rice	6,552.0	38.7%
Eco-friendly rice	9,339.5	40.3%
Organic rice	659.7	95.2%

3. Factor analysis on consumer attitudes toward food consumption

In this paper, individual levels of altruism and other attitudes toward food consumption were measured using psychometric scales. The approach typically involved asking people to respond to Likert-type scale (Likert (1932)) questions, where they indicated their level of agreement to a list of statements. One benefit of using a psychometric scale to measure attitudes toward food consumption is that individuals can easily respond to Likert scales without being given many instructions.

The attitudes toward food consumption were measured by a factor analysis on five-scale items, determining the consumers' agreement or disagreement with a series of statements.

According to the result of the factor analysis, the following seven factors were

found to be attitudes toward food consumption[2]. (a) Altruism: the degree to which an individual receives utility from the utility of others, (b) Low price: the degree to which an individual wants to purchase low-price products, (c) Normative: the degree to which an individual enjoys normative eating habits, (d) Safety: the degree to which an individual is conscious of food safety, (e) Information: the degree to which an individual is concerned about information regarding food, (f) Health: the degree to which an individual is conscious of a healthy diet, and (g) Low cal: the degree to which an individual tends to purchase low-calorie food. The contribution ratios are shown in Table 5.

Table 5. Result of a factor analysis on consumer attitudes

	Contribution rate	Accumulative Contribution Rate	Minimum score	Maximum score
Altruism	0.075	0.075	−4.87	4.26
Low_price	0.07	0.145	−3.33	2.95
Normative	0.066	0.211	−5.42	4.02
Safety	0.066	0.277	−6.73	4.40
Information	0.057	0.334	−3.08	3.92
Health	0.054	0.389	−4.02	3.67
low-calorie	0.037	0.425	−3.91	3.20

This paper primarily focuses on the altruism attitude. The statements that made up the altruism-attitude scale were as follows:

Statement 1. I am willing to purchase products that lead to the revitalization of rural areas (factor loading is 0.878).

Statement 2. I am willing to purchase products that lead to the assistance of developing countries (factor loading is 0.834).

Statement 3. I am willing to purchase products that lead to the improvement of self-sufficiency in food products (factor loading is 0.812).

Statement 4. I want to preserve traditional food cultures (factor loading is 0.454).

Statement 5. I am willing to purchase eco-friendly products (factor loading is 0.445).

For use in subsequent analysis, the attitude variables were constructed by

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[2] Promax rotation was applied as a rotation method. Factor loadings were calculated using the maximum likelihood method.

calculating a factor score for each consumer[3]. The ranges of scores are shown in Table 5. Each combination between scales had a correlation coefficient of up to 0.32, supporting the notion that the attitude scales are indeed measuring unique constructs (Table 6).

Table 6. Correlation matrix of factor scores

	Altruism	Low_price	Normative	Safety	Information	Health	Low_cal
Altruism	1.000						
Low_price	0.029	1.000					
Normative	–0.170	–0.021	1.000				
Safety	–0.318	0.121	–0.482	1.000			
Information	–0.158	–0.284	0.073	0.075	1.000		
Health	–0.073	0.032	0.045	–0.218	–0.402	1.000	
Low_cal	–0.093	–0.211	–0.092	0.075	0.171	–0.322	1.000

4. Estimate of the food consumption function

The rice consumption is modeled as a Tobit model. The endogenous variable is YRi, if household i consumes the type R rice, and YRi = 0, if the household does not consume the item in question. This endogenous variable is a function of the exogenous variables governing the purchasing decision for type R rice. The purchase decision is modeled as a function of attitudinal and demographic variables and past consumption, as follows:

$$y_{Ri} = \begin{cases} y_{Ri}^{*} = \alpha_R + \sum_k \beta_R x_{ik} + \varepsilon_{Ri} & (y_{Ri}^{*} > 0) \\ 0 & (y_{Ri}^{*} \leq 0) \end{cases},$$

where y_{Ri} is the average annual purchase amount of type R rice for the household i, and x_{ik} s are explanation variables.

The results of the Tobit estimation by maximization of the likelihood function for each group are presented in Table 1. Many of the variables are significant at the 5% level. The older the member households, the higher the consumption of Ordinary and Eco-friendly rice. However, for organic rice, age had no significant impact. Households

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[3] Factor scores were calculated using the regression method.

that completed parenting and single member households were less likely to consume Eco-friendly and Ordinary rice, compared to the base category of households with children. The longer the membership to the co-op and the larger the income, the higher the consumption of all the types of rice. Each absolute value of the coefficient of Organic rice was the biggest.

There are no significant impacts of household size, with the exception of the coefficient of Ordinary rice, where the significance level is 10%.

Some attitudinal variables were quite significant when explaining the current purchase behavior of rice. For Ordinary rice, Health attitudes decreased the purchase with a 10% significance level. There were no significant impacts from other attitudes. Therefore, the purchase of Ordinary rice primarily depended on demographic variables, and the attitudes toward food consumption had little effect on it.

However, for Eco-friendly and Organic rice, the attitudes of Safety, Low-price, and Altruism affected consumption. The stronger the Safety attitude, the higher the consumption of Eco-friendly and Organic rice. In contrast, the weaker the Low price attitude, the higher the consumption of Eco-friendly and Organic rice. Moreover, the stronger the Altruism attitude, the higher the consumption of Eco-friendly and Organic rice.

In addition, for type of Organic rice, In addition, higher Normative and Health values imply an increased consumption of Organic rice.

As Table 7 shows, Eco-friendly and Organic rice is more expensive than Ordinary rice. Therefore, it is reasonable for the consumption of different types of rice to be affected by a Low price attitude.

To cultivate Eco-friendly or Organic rice, pesticides and chemical fertilizer usage is less than that used for the cultivation of Ordinary rice (Table 1). There are two aspects to the characteristics of the method of cultivation.

One is the reduced number of food safety risks for the consumer. Therefore, it can be understood that consumers who were conscious about food safety were more likely to consume Eco-friendly and Organic rice. This motivation to consume such rice was interpreted as a kind of "egoistic" motivation, which is suitable for "homo economics."

Another aspect is the improvement in the environment of the place where the rice was cultivated. Even though it might not affect the consumer directly, the improvements in the environment might have a positive effect on some parsons. Therefore, the consumer who had a strong Altruism attitude would have commended this aspect and purchased Eco-friendly and Organic rice. Rice is the staple food of the Japanese people, and hence, it is purchased frequently.

In addition, the consumption of Organic rice is largely affected by attitudinal variables rather than demographic ones. This implies that the purchase behavior for Organic rice depends almost primarily on the attitude toward food consumption and very little on the family structures or other household characteristics.

Table 7. Estimation results

	Ordinary rice			Eco-friendly rice			Organic rice		
	coefficient		SD	coefficient		SD	coefficient		SD
Constant	−7807.1	***	2766.9	−17208.9	***	3427.1	−60340.5	***	11105.0
attitude variables									
Altruism	−106.0		423.9	1819.6	***	527.2	9277.3	***	1922.9
Low_price	625.9		463.2	−2368.9	***	571.6	−9985.7	***	1952.8
Normative	−381.7		445.9	820.4		553.0	4466.4	**	1778.6
Safety	−279.0		427.1	1621.8	***	535.3	10817.9	***	2276.5
Information	−611.4		443.8	−633.8		549.2	−2083.9		1678.9
Health	−1026.4	*	434.7	−542.1		538.6	3249.8	*	1697.9
Low_cal	−453.6		441.6	−703.5		548.0	−2178.3		1630.6
demographic variables									
Age	91.46	*	50.05	213.63	***	61.49	−98.81		183.0
Membership period	6.30	***	1.93	14.95	***	2.36	19.76	***	7.15
Income	612.8	**	259.5	1301.2	***	318.8	1951.6	**	933.3
Size	783.7	*	442.5	849.9		546.2	−566.5		1701.2
Single	−8963.7	***	3192.8	−7791.9	**	3825.4	−819.1		11227.0
A married couple without children	−1690.3		1667.8	−3752.6	*	2065.8	5470.9		5754.7
Finished parenting	−5037.5	***	1566.6	−3783.7	**	1899.1	259.9		5420.1
ln(sd)	9.59	***	0.02	9.82	***	0.02	10.26	**	0.09
log likelihood	−10914.56			−11476.71			−1274.87		

*** Statistically significant at the 1% level, ** Statistically significant at the 5% level, * Statistically significant at the 10 % level

5. Conclusion

This paper investigates the effect of consumer altruism on rice consumption in Japan, by using single-source data comprising scanner and detailed questionnaire data. It was found that altruism and other attitudes have a significant influence on food consumption. Since rice is the staple food for most Japanese, it is purchased frequently. This implies that many Japanese consumers' altruistic attitudes are reflected in their daily and ordinary rice consumption. These findings suggest that a pipeline to provide public

goods via daily food consumption might exist.

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