Gaming Simulation using Electronic Community Currency:
Behavioral Analysis of Self-versus-Community Consciousness

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1. Introduction

Conventional community currencies (CCs) are classified into three types: paper CCs (centrally issued, circulating), note CCs (dispersively issued, circulating), and account CCs (dispersively issued, mutually paid). Recent ICT advancements have not only electronized these three types of CCs but also facilitated a fourth type—centrally issued, mutually paid CCs. For example, CCs that use media such as smartcards are centrally issued but owned by each user in a decentralized way. However, owing to existing networking technology and networking devices and lines, it is now possible to make payments through mutual value transfers on remote servers. Although such payment technology is typically utilized for B2C (business-to-consumer) commercial transactions, CCs that deal with non-commercial transactions (volunteer) and electronic money that deals with commercial transactions (business) could merge further in the future.

Centrally issued, mutually paid electronic CCs improve the convenience and efficiency of individual payments through electronic recording and calculation processes. Moreover, they can change the operation of CCs in two main ways. First, they make it possible to create several complicated media designs (institutional currency designs) and can incorporate more than one currency in each medium. Furthermore, during the introduction or circulation period, one can change parameters such as the premium rate, liquidation fee, depreciation rate, upper and lower balance limits, and points and fees per transaction. Second, the traceability of transactional data is improved, making it possible to analyze in real-time the records of individual transactions, overall issued balance, overall transaction amounts, velocity of circulation, circulation route, and circulation network. Such information could be utilized to select a suitable media design for the issuers' objectives and to disclose information on CCs to participants.

Such changes in the operation of CCs could alter the kind of information on CCs and their communities possessed by participants, thus affecting their subsequent knowledge and behavior. Providing various CC parameters as well as aggregate information on circulation amount and CC

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transactions and activities to participants would transform their understanding about these communities and CCs. In light of the foregoing, in the present study, we build a contactless card payment system and a virtual community of local shops, local NPOs (nonprofit organizations), local consumers, and chain stores within a computer room in order to examine how electronic CCs work. We then perform an experiment using a gaming simulation and an ex post questionnaire in order to examine participants' behavior patterns. Such patterns can change depending on (1) the premium rates of CCs, (2) participants' consciousness about self and community, and (3) the availability of aggregate information on the transactions and activities in the community.

2. Experimental Method

In this study of a contactless card payment system, we recruited 12 experiment subjects (undergraduate and graduate students) and carried out an experiment using a gaming simulation.[3] In the computer room, we set up a virtual community composed of 2 local shops, 2 local NPOs, 2 chain stores, and 12 local citizens (consumers). Each player used an electronic card to record the values of the legal currency "Yen" and of the fabricated CC termed "Clark."[4] By using their own computers, consumers could perform a number of actions: purchase Clark for Yen (shops could convert Clark into Yen), inquire about their balances, or confirm their transaction histories. Consumers could also carry out "transactions" in local shops, local NPOs, or chain stores by choosing to buy goods and services, volunteering, working part-time, or donating. However, consumers could pay by using either Clark or Yen (or both) in local shops, whereas NPOs accepted only Clark and chain stores (located outside the community) accepted only Yen (Figure 1).

Because this experiment aimed to observe economic behavior with the CCs investigated herein, we abstracted irrelevant factors in order to smooth the progress of the game. Of course, in order to carry out actual market transactions, it was necessary to discover the parties we were dealing with, to know what (and on what terms) we were dealing, to conduct negotiations, to draw up the contract, to confirm that the terms of the contract were being observed, and so on. The costs of these activities (transaction costs) might condition the manner of transactions and even the establishment of the transactions themselves (Coase 1937, 1960). Even in the case of transactions using CCs, this fact might be essential. Thus, we removed any transaction costs that were not specific to the use of CCs in order for players to focus their attention on the choices

[3] The time required for the experiment was 3 hours, for which we provided participants with book vouchers worth 2,000 yen (about 15 euros under the current exchange rate).

[4] This was named after William Smith Clark, who was a prominent advisor for Sapporo Agricultural College, now Hokkaido University, where the experiment in this study was conducted.

between CCs and legal currencies. Further, in order to prevent the games from becoming only a problem of price negotiation and supply-and-demand matching, which are irrelevant to the characteristics of the currencies used, the kinds and prices of the goods and services provided by players were defined in advance (Table 1). It was also assumed that their stock was unlimited.

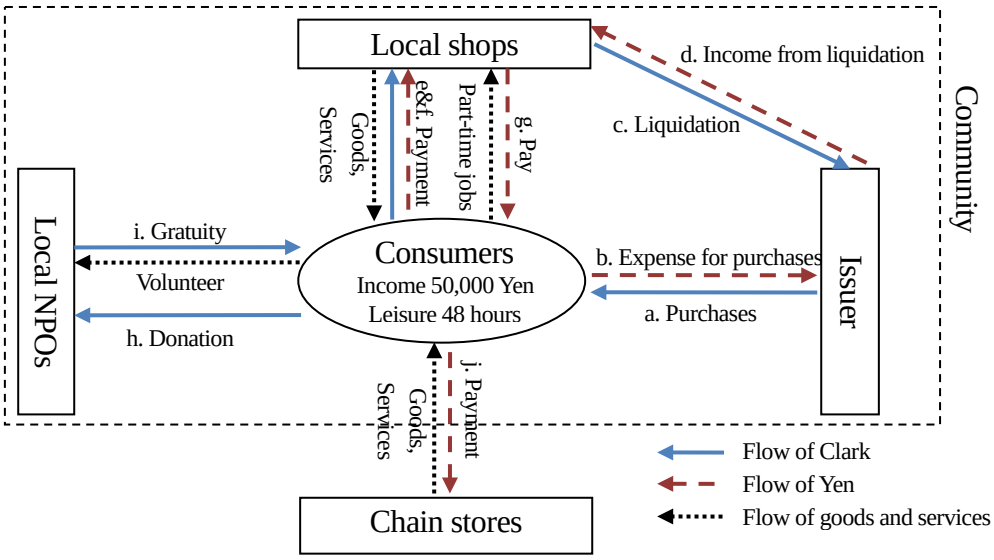

Figure 1 Flow of Clark and Yen

In this experiment, for simplification, we focused on consumers' behavior with CCs and assumed that all shops and NPOs play only passive roles. In other words, the roles of the local shops, local NPOs, and chain stores were played by experiment assistants (not by experiment subjects). Specifically, these assistants sold goods and services to (and received Clark or Yen from) consumers, accepted part-time workers from (and paid Yen to) consumers, accepted volunteers from (and paid Clark to) consumers, and accepted donations (in Clark) from consumers under the allocated budget constraints. By contrast, within their income of 50,000 Yen and leisure time of 48 hours per game, consumers could buy the necessary amount of Clark and choose freely from the various uses of their Clark or Yen amounts. At the beginning of each game, subjects were required to choose "self" or "community" as their behavioral priority, write down their choice on the reverse of their currency cards, and follow their behavioral priority in each game.[5]

[5] In addition, we asked experimental subjects their ex post weight for "self" and "community" (on a scale of 10:0 to 0:11) in their actual behavior in each game. Although we cannot completely control for experiment subjects' behavior, we can secure the reproducibility and analyzability of the experiment by making experiment subjects choose their behavioral tendencies by themselves and quantifying those tendencies by using a scale.

Table 1 Menu of goods and services provided

Seller	Buyer	Name of goods and services	Payment (Gratuity)	Required time
Local shop A	Consumers	1. Side dishes, lunch	1,500 Yen / Clark	-
		2. Alcohol	2,000 Yen / Clark	-
		3. Kitchen items	7,500 Yen / Clark	-
		4. Stationery	1,700 Yen / Clark	-
		5. Books	1,150 Yen / Clark	-
		6. Music CDs	1,400 Yen / Clark	-
		7. Movie DVDs	1,700 Yen / Clark	-
		8. Game software	11,500 Yen / Clark	-
		9. Tearoom	1,000 Yen / Clark	2 hours
		10. Cheap restaurant	1,000 Yen / Clark	2 hours
Local shop B	Consumers	1. Bags	11,500 Yen / Clark	-
		2. Clothes	8,000 Yen / Clark	-
		3. Shoes	5,800 Yen / Clark	-
		4. Sporting goods	20,000 Yen / Clark	-
		5. Tools	10,000 Yen / Clark	-
		6. Gardening supplies	4,000 Yen / Clark	-
		7. Pet products	5,000 Yen / Clark	-
		8. Camping equipment	30,000 Yen / Clark	-
		9. Bicycles	23,000 Yen / Clark	-
		10. Karaoke	3,500 Yen / Clark	2 hours
Chain store A	Consumers	1. Side dishes, lunch	1,300 Yen	-
		2. Alcohol	1,700 Yen	-
		3. Shoes	5,000 Yen	-
		4. Bags	10,000 Yen	-
		5. Clothes	7,000 Yen	-
		6. Kitchen items	6,500 Yen	-
		7. Interior accessories	20,000 Yen	-
		8. Stationery	1,500 Yen	-
		9. Café	2,000 Yen	2 hours
		10. Restaurant	5,000 Yen	2 hours
Chain store B	Consumers	1. Books	1,000 Yen	—
		2. Music CDs	1,200 Yen	—
		3. Movie DVDs	1,500 Yen	—
		4. Game software	10,000 Yen	—
		5. Bicycles	20,000 Yen	—
		6. PCs	50,000 Yen	—
		7. Karaoke	3,000 Yen	2 hours
		8. Bowling	2,000 Yen	1 hour
		9. Movie theater	1,800 Yen	2 hours
		10. Domestic travel	70,000 Yen	24 hours
Consumers	Local NPO A[6]	1. Educational activity of the youth (Assistance for camping)	1,000 Clark	24 hours
		2. Assistance for festivals and events	200 Clark	3 hours
		3. Patrol for the safety of children and road users	100 Clark	1 hour
		4. Cleaning and gardening activity in the community	150 Clark	1 hour
		5. Teaching at a free school	450 Clark	3 hours
		6. Donation	1,000 Clark	—
	Local NPO B[7]	1. Support for child care (temporary day care)	500 Clark	5 hours
		2. Support for the elderly (shopping and so on)	300 Clark	2 hours
		3. Nursing care for the elderly (personal care)	800 Clark	8 hours
		4. Assistance for neighbors (yard maintenance and pet care)	300 Clark	3 hours
		5. Crop work in the neighborhood	600 Clark	6 hours
		6. Donation	1,000 Clark	—
	Local shop A	Part-time job	1,000 Yen	1 hour
	Local shop B	Part-time job	1,000 Yen	1 hour

* Shaded goods and services can be replaced by those with the same name.

[6] Volunteer work at NPO A concerns the events and activities held by the groups in the local community.
[7] Volunteer work at NPO B, by contrast, concerns support for particular individuals in the local community.

Each game lasted 20 minutes and we played five games under different game conditions. The game conditions included the media design of CC and the method of giving feedback about the transaction data to experiment subjects as aggregate information (Table 2). For the parameters concerning the media design of CC, we set the premium rate (10%, 15%, 20%) in each game but did not introduce a depreciation rate, upper balance limit, or points or fees per transaction. The lower balance limit was fixed at zero. The rate of liquidation fee was the same as the premium rate, because local shops in this experiment, which would pay the liquidation fee, had no options to join or leave the CC, nor could they decide on the prices of their merchandise. For the method of feeding back aggregate information, we prepared three modes to display information (non-display, bar chart, and line chart), and the selected mode was altered between games or in the middle of the game (10 minutes after the game had started). The information used in this experiment was composed of 11 kinds of aggregate information based on the quantity of various transactions and activities in terms of Clark and Yen (Table 3).

Table 2 Changes in the conditions between the games

Game progress	Premium and liquidation fee rates	Feedback method (Arrows show a change after 10 minutes)
Game I	both 10%	non-display -> bar chart
Game II	both 10%	non-display -> line chart
Game III	both 20%	non-display -> bar chart
Game IV	both 20%	non-display -> line chart
Game V	both 15%	bar chart -> line chart

Table 3 Information displayed in the games

a. Cumulative total of consumers' purchases (in Clark)
b. Cumulative total of consumers' expenses for purchases (in Yen)
c. Cumulative total of local shops' liquidation (in Clark)
d. Cumulative total of local shops' income from liquidation (in Yen)
e&f. Cumulative total of all consumption in local shops (in Clark and Yen) (=e+f)
e. Cumulative total of consumption in Clark in local shops (in Clark)
f. Cumulative total of consumption in Yen in local shops (in Yen)
g. Cumulative total of pay for part-time jobs in local shops (in Yen)
h. Cumulative total donations to local NPOs (in Clark)
i. Cumulative total of gratitude for volunteering in local NPOs (in Clark)
j. Cumulative total of consumption in chain stores (in Yen)

* The letters in Table 3 correspond to the flows of Clark and Yen in Figure 1.

The game design shown above is based on the following hypotheses. First, for the premium rate, we hypothesized that the higher the premium rate at which experiment subjects buy Clark for Yen, the more Clark they purchase, and vice versa. Consumers compare inside and outside prices in real terms (with the premium rate considered) and consume either in local shops or in chain stores depending on those prices. In this experiment, we offered some goods and services with the same name in both local shops and chain stores. The prices of merchandise were fixed so that the 10% premium rate made inside prices higher than outside prices, the 20% premium rate made outside prices lower than inside prices, and the 15% premium rate made either price higher depending on the kind of merchandise.

Second, for the methods of displaying information, we hypothesized that if experiment subjects could see that information, they would know other people's behavior and thus they would alter their behavior using Yen and Clark. Further, different ways of displaying information would bring about different influences. For example, bar charts (which show information at a specific point in time) would be less useful than line charts (which show information changing over time) for grasping the overall trends in the community. The changes in these conditions such as the premium rate and the methods of displaying information were not told to the experiment subjects before each game had started.

Lastly, for the knowledge and behavior of experiment subjects, we hypothesized that each player's consciousness of self and community would determine his or her behavior and the activity of the community. To test this hypothesis, we asked experiment subjects to choose their behavioral priority ("self" or "community") at the beginning of each game in order to compare this ex ante priority with the ex post priority in their actual behavior. In this way, we aimed to examine how such simple behavioral priority might lead to certain particular behaviors under the particular institutional structures including the CC.[8]

3. Experimental results, Questionnaire results and their Implications

3.1 Amounts of Currencies and their Velocity of Circulation

In general, the circulating conditions of CCs can be estimated using the amount of currency issued, the amount liquidated, the outstanding issued amount, and the aggregate amounts of various transactions using those currencies. Furthermore, based on those aggregates, we can calculate velocity of circulation as their degree of contribution to the activeness of communities, which we can compare with that of legal currencies. Within the framework of this experiment, we can calculate the amount of Clark issued (a), the amount of Clark liquidated (c), the outstanding

[8] In this respect, this experiment is different from laboratory experiments that produce a completely controlled environment. This experiment rather aims to provide experiment subjects with social contexts that are free to some extent and to reconstruct realities for experiment subjects.

issue of Clark (a-c), the amount of transactions using Clark (e+h+i), the local inflow of Yen (e.g., if income is Yen 50,000, 12 consumers earn Yen 600,000), the local outflow of Yen (j), the local circulating balance of Yen (600,000−j), and the local amount of transactions using Yen (f+g). In addition, the velocities of circulation of Clark and Yen can be obtained using the following formulas, respectively.

$$\text{The velocity of circulation of Clark} = \frac{\text{The amount of transactions using Clark from the game start to the game end } (e+h+i)}{\text{The outstanding issue of Clark at the game end } (a-c)}$$

$$\text{The velocity of circulation of Yen} = \frac{\text{The amount of transactions using Yen from the game start to the game end } (f+g)}{\text{The outstanding issue of Yen at the game end } (600{,}000-j)}$$

For each of the five games, the table below is obtained by calculating these indexes (Table 4).

Table 4 The amount and the velocity of circulation during each game[9]

Game progress	The amount of transactions using Clark	The amount of Clark issued	The amount of Clark liquidated	The outstanding issue of Clark	The velocity of circulation of Clark	The amount of transactions using Yen	The local inflow of Yen	The local outflow of Yen	The local circulating balance of Yen	The velocity of circulation of Yen
Game I	270,000	306,658	217,350	89,308	3.02	218,700	600,000	298,900	301,100	0.73
Game II	476,750	476,740	312,400	164,340	2.90	209,900	600,000	185,400	414,600	0.51
Game III	479,300	473,334	269,600	203,734	2.35	202,000	600,000	289,800	310,200	0.65
Game IV	641,500	657,737	349,500	308,237	2.08	231,400	600,000	156,800	443,200	0.52
Game V	482,500	562,806	328,500	234,306	2.06	248,000	600,000	190,500	409,500	0.61

This table shows that the velocity of circulation of Clark is 3 to 6 times higher than that of Yen. This is a result of the institutional structure of the local currency community used in this experiment. The flow of Clark and Yen (Figure 1) show that Yen obtained as income or pay for part-time work by consumers must be used (when used within the community) in local shops or converted to Clark (i.e., excluding chain stores). In contrast, although Clark obtained in exchange of Yen or volunteer work can be used in local shops or local NPOs, consumers themselves cannot liquidate Clark into Yen. Thus, Clark, which has several usages (i.e., circulation routes), is structurally easy to circulate, and, therefore, contributes to the transaction activity and has a

[9] Only local shops can liquidate Clark into Yen. Because liquidation is performed as needed at the experiment assistants' discretion, some Clark are left at the local shops even at the game end (Tables 8-1 – 8-5). Therefore, in order to remove such arbitrariness within the calculation of the velocity of circulation, we can assume that all Clark at the local shops are liquidated. Then, the recalculated velocity of circulation in the games I–V are 3.92, 3.91, 5.92, 5.51, and 3.57, respectively, which are even higher than those of Yen.

significantly higher velocity of circulation than Yen does.

In addition, the per-minute velocities of circulation of Clark and Yen are calculated using the following formulas, respectively.

$$\textit{The per-minute velocity of circulation of Clark from t to t+1 minutes after game start} = \frac{\textit{The amount of transactions using Clark from t to t+1 minutes after game start}}{\textit{The outstanding issue of Clark at t+1 minutes after game start}}$$

$$\textit{The per-minute velocity of circulation of Yen} = \frac{\textit{The amount of transactions using Yen from t to t+1 minutes after game start}}{\textit{The outstanding issue of Yen at t+1 minutes after game start}}$$

Using these formulas, the development of velocity of circulation in each game is shown in Figures 2-1 – 2-5, respectively.

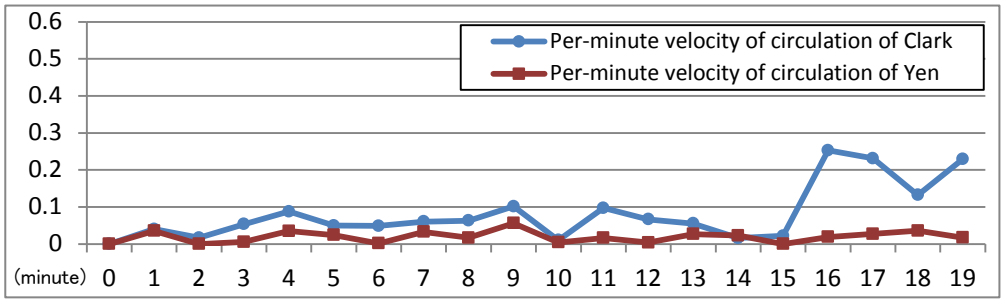

Figure 2-1 The development of the velocity of circulation in Game I

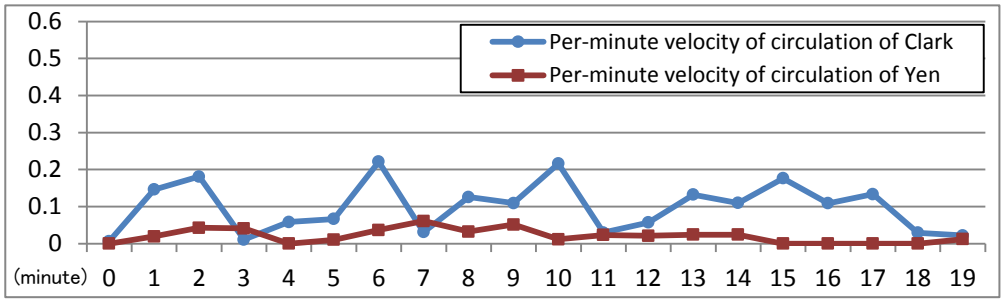

Figure 2-2 The development of the velocity of circulation in Game II

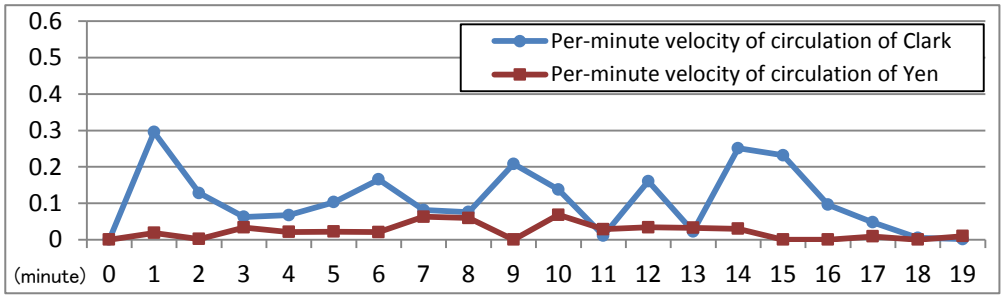

Figure 2-3 The development of the velocity of circulation in Game III

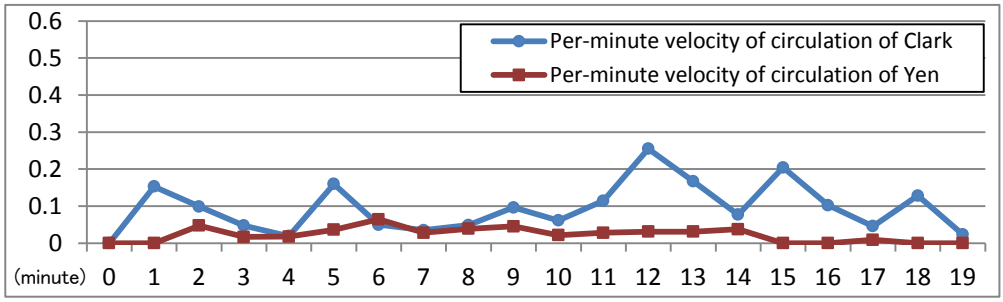

Figure 2-4 The development of the velocity of circulation in Game IV

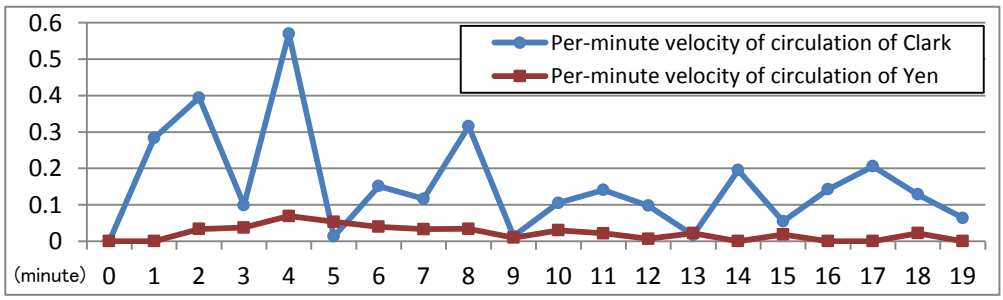

Figure 2-5 The development of the velocity of circulation in Game V

These changes in velocity of circulation are determined using the developments of experiment subjects' activities, which in turn are related to the alteration of game conditions (e.g., the increase and decrease of premium rate) and the methods of displaying aggregates, or to experiment subjects' behavioral objectives. In Section 3.2, we first confirm the attributes of experiment subjects that could condition the game, the quantitative development of experiment subjects' various behaviors, and the influence of premium rates on those behaviors. We examine the relationship between experiment subjects' behaviors and their behavioral objectives in Section 3.3 and the relationship between experiment subjects' behaviors and the graphs of aggregates in Section 3.4.

3.2 The Attributes of Experiment Subjects, the Premium Rate, and the Amounts of Activities

According to the ex-post questionnaire, the majority of the experiment subjects in this experiment had little prior knowledge and experience of CCs. Regarding the question "Do you know about community currencies?", two subjects answered "I know them well," nine answered "I don't know them well but I have heard about them," and one answered "I know nothing about them."[10] To the question "Have you ever used community currencies?" two subjects (i.e., those that were knowledgeable in the previous question) answered "I have used community currencies" and 10 answered "I've never received or used community currencies." Therefore, the majority of

[10] To the question "What image do you have about community currencies?", 11 of 12 subjects chose "Vitalization of local areas" (1 of 12 provided an invalid answer) from the alternatives of "Volunteer," "Vitalization of local areas," "Ecology," "Connection of people," and "I'm not sure."

experiment subjects had to learn the role of CCs, especially the meaning and function of the electronic CC within the virtual community setup in this experiment. Even though experiment subjects were provided with a map of the virtual community in the room and the flow chart of currencies (Figure 1), they might have understood the structure of the games only after they actually experienced them.

The development of the cumulative amount of the subjects' activities is shown in terms of Clark and Yen in Figures 3-1–3-5. These graphs are the same as the "line charts" of the aggregates that experiment subjects could see during the games.

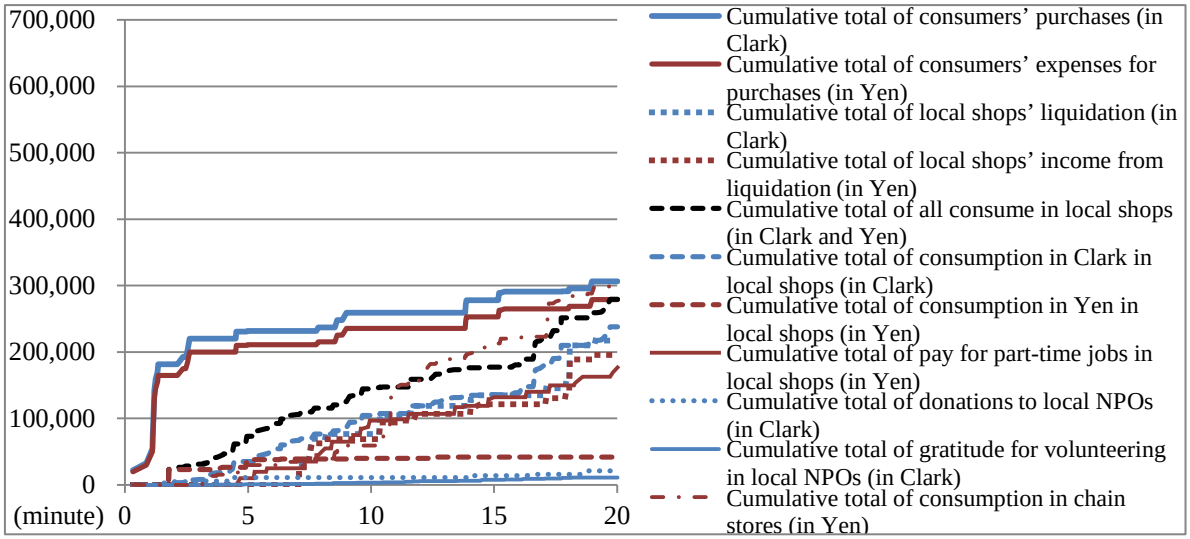

Figure 3-1 The development of various aggregates in Game I

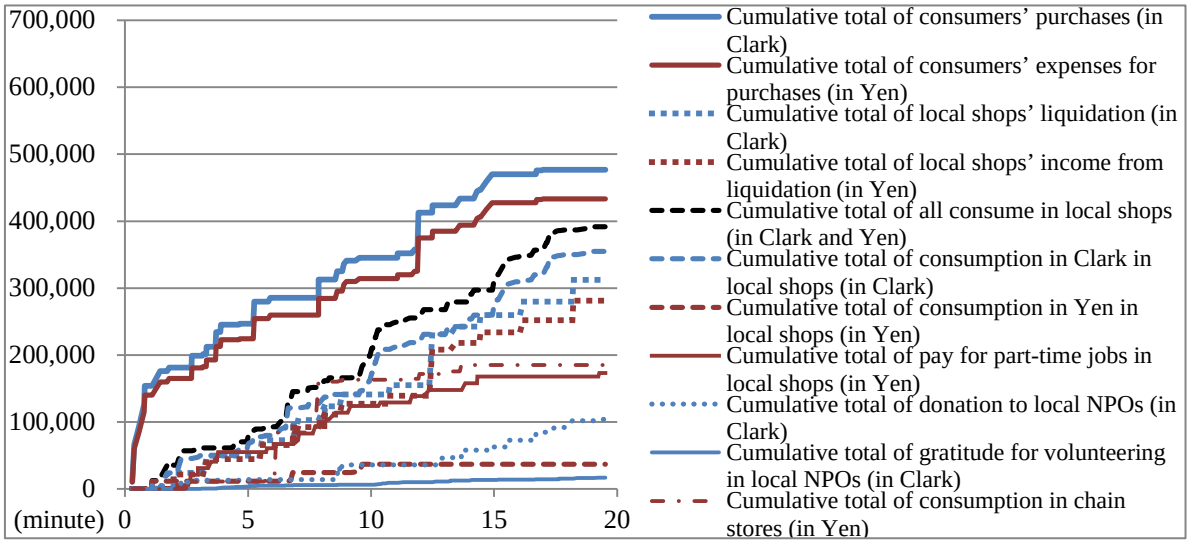

Figure 3-2 The development of various aggregates in Game II

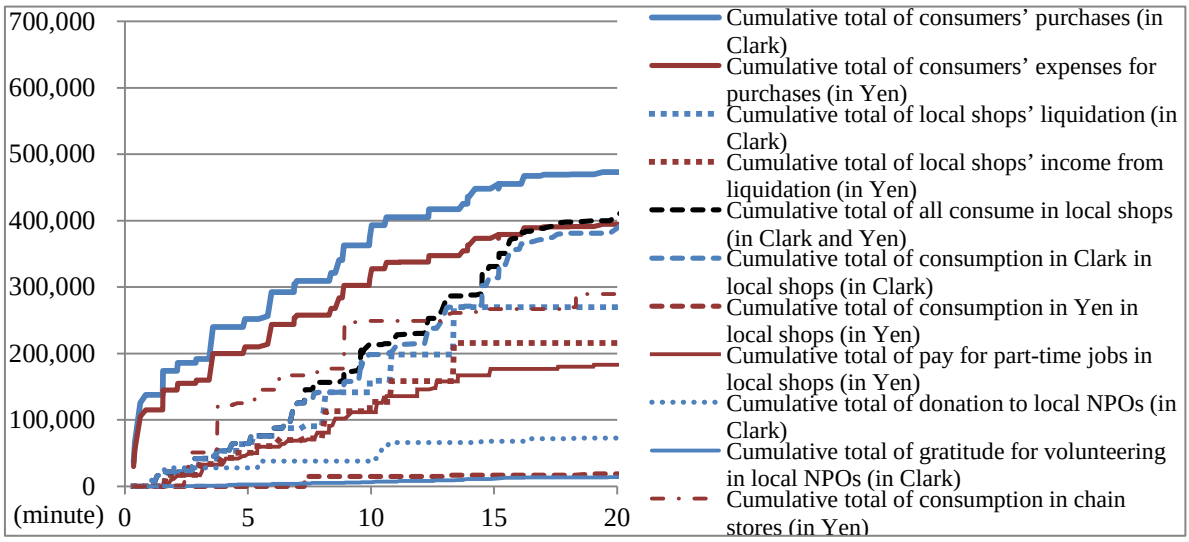

Figure 3-3 The development of various aggregates in Game III

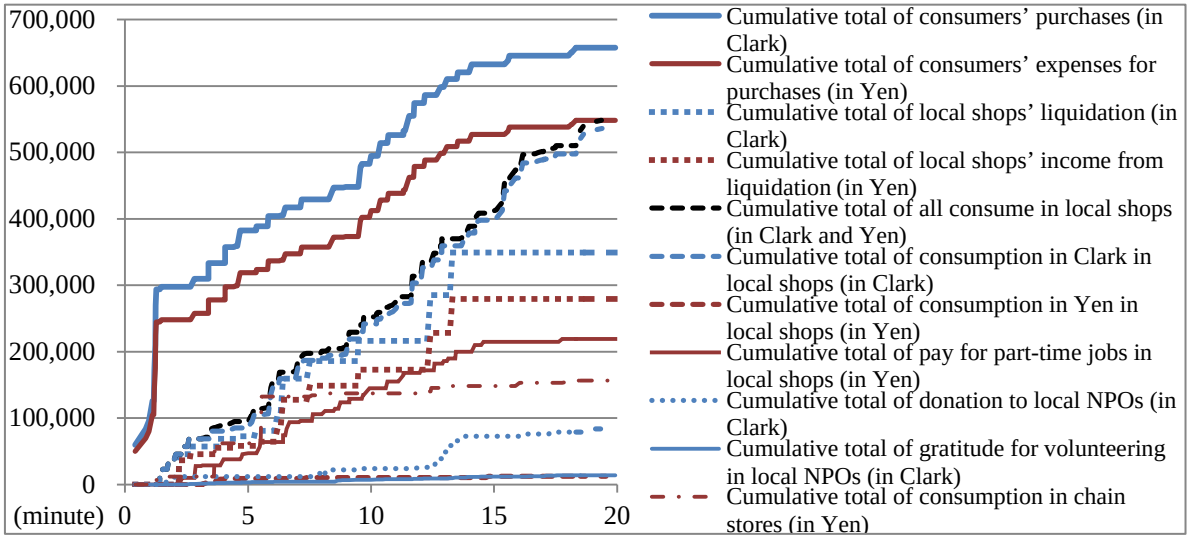

Figure 3-4 The development of various aggregates in Game IV

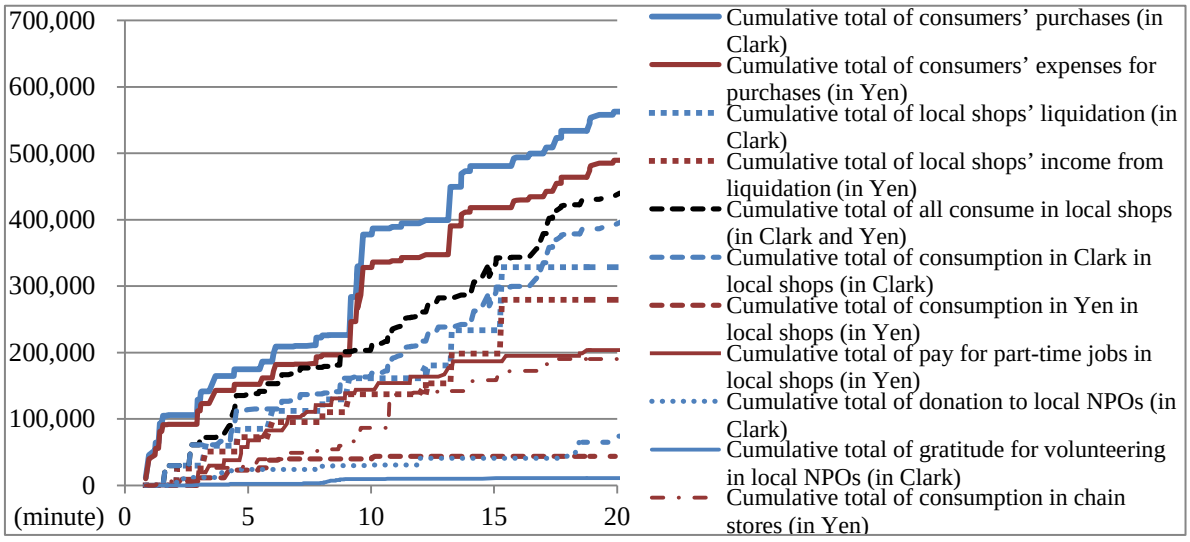

Figure 3-5 The development of various aggregates in Game V

We then attempted to locate the factors that determined the amount purchased and the amounts of various transactions of Clark in each game. According to our hypothesis proposed in Section 2, one of those factors might be the premium rate. However, the relationship between the premium rate and all consumers' amounts of various activities in each game is shown in Table 5 below, where we cannot find any statistically significant correlation.

Table 5 The correlation of the premium rate and the amounts of activities in each game

Game Progress	Premium rate	Cumulative total of consumers' purchases (in Clark)	Cumulative total of consumers' expenses for purchases (in Yen)	Cumulative total of all consumption in local shops (in Clark and Yen)	Cumulative total of consumption in Clark in local shops (in Clark)	Cumulative total of consumption in Yen in local shops (in Yen)	Cumulative total of pay for part-time jobs in local shops (in Yen)	Cumulative total of donations to local NPOs (in Clark)	Cumulative total of gratitude for volunteering in local NPOs (in Clark)	Cumulative total of consumption in chain stores (in Yen)	Consumption in local shops / Consumption in chain stores	Gratitude for volunteering / Pay for part-time jobs
Game I	10	306,658	278,780	279,550	237,850	41,700	177,000	21,000	11,150	298,900	0.935	0.062
Game II	10	476,740	433,400	391,800	354,900	36,900	173,000	105,000	16,850	185,400	2.113	0.097
Game III	20	473,334	394,445	411,400	392,400	19,000	183,000	73,000	13,900	289,800	1.419	0.076
Game IV	20	657,737	548,114	553,700	541,300	12,400	219,000	86,000	14,200	156,800	3.531	0.065
Game V	15	562,806	489,388	441,600	397,600	44,000	204,000	74,000	10,900	190,500	2.318	0.053
Correlation coefficient with the premium rate		0.670	0.565	0.745	0.785	-0.830	0.663	0.265	0.010	-0.144	0.481	-0.291
p-value		0.216	0.321	0.148	0.116	0.082	0.222	0.667	0.987	0.817	0.411	0.634

Then correlation coefficients between the premium rates and amounts of various activities in Games I–V per consumer are shown in Table 6 below. Only 2 of the 12 experiment subjects (i.e., Consumers A and C) took action to increase their consumption in local shops when the premium rate rose, which increased the amount purchased. For Consumer A, when the premium rate rose, he increased his part-time job (to receive more Yen to purchase more Clark), increased his donation to local NPOs (to use more leftover Clark), used no Yen in local shops, and decreased his consumption in chain stores (to buy relatively inexpensive items in local shops). Two other consumers (i.e., Consumers B and G) reduced their volunteer work in local NPOs when the premium rate rose (because the purchase from Yen was a more advantageous method for obtaining Yen than the gratuity for volunteering was). Thus, the response of the experiment subjects to the premium rate varied, but the effect of the premium rate in this experiment was small on average.

This analysis is based on the *behaviors* of experiment subjects. Next, we include their *motives* into our analysis.

Table 6 The correlation of the premium rate and the amounts of activities through all games

Correlation coefficient with the premium rate in Games I–V	Cumulative total of consumers' purchases (in Clark)	Cumulative total of consumers' expenses for purchases (in Yen)	Cumulative total of all consumption in local shops (in Clark and Yen)	Cumulative total of consumption in Clark in local shops (in Clark)	Cumulative total of consumption in Yen in local shops (in Yen)	Cumulative total of pay for part-time jobs in local shops (in Yen)	Cumulative total of donations to local NPOs (in Clark)	Cumulative total of gratitude for volunteering in local NPOs (in Clark)	Cumulative total of consumption in chain stores (in Yen)
Consumer A	0.940*	0.939*	0.937*	0.937*	-	0.896*	0.913*	-0.559	-0.892*
Consumer B	0.108	0.060	0.044	0.074	-0.140	0.824	0.502	-0.907*	0.192
Consumer C	0.910*	0.898*	0.932*	0.932*	-	-	0.792	-0.265	-0.165
Consumer D	0.554	0.518	0.869	0.751	0.180	-0.066	-0.456	0.208	-0.559
Consumer E	-0.244	0.310	-0.193	-0.197	0.020	0.591	-0.280	-0.434	0.388
Consumer F	-0.842	-0.890*	-0.475	-0.475	-	-	-0.280	0.770	0.242
Consumer G	-0.187	-0.247	-0.183	0.292	-0.559	0.749	-0.563	-0.906*	0.754
Consumer H	-0.496	-0.542	-0.783	-0.711	-0.908*	-0.498	0.273	0.326	0.544
Consumer I	0.829	0.727	0.375	0.375	-	0.688	-0.144	-0.205	-0.493
Consumer J	0.553	0.644	0.201	0.201	-	-0.494	0.570	0.400	-0.662
Consumer K	0.669	0.609	0.755	0.753	-0.559	-0.227	0.354	0.407	-0.521
Consumer L	0.018	-0.034	-0.051	0.023	-0.559	-0.030	0.157	-0.028	0.303

- not applicable, * Statistically significant at the 5% significance level

3.3 Experiment Subjects' Behavioral Objectives and Self-versus-Community Consciousness

In this experiment, experiment subjects are given the following three instructions for their behavior.

1. Choose and mark "self" or "community" on the reverse of your currency card, and follow that behavioral priority.
2. It is up to you how to use or save given income and leisure time.
3. Do not touch other persons' currency cards nor PCs, and avoid looking at their PCs.

Before each game starts, on the reverse of currency cards, experiment subjects are asked "In this game, will you prioritize self or community?," and required to choose "self" or "community." After all the five games, they were asked in the questionnaire "What was your actual weight on self and community in game ...?," and required to choose the ratio of "self : community" that matches their actual feelings on a scale of 10:0 to 0:10. That is, the rationality or internal consistency required for experiment subjects in this experiment would not be their consistent pursuit of self-interest, but the consistence in their weight on self versus community.[11]

Let us see if the experiment subjects had such a consistency between *ex ante* and *ex post*

[11] Therefore, in this experiment, we did not use such a method to motivate experiment subjects to compete by promising the monetary rewards (cash) linked to the result of game. Gratuity for the subjects' participation to the experiment was provided in the other form than cash (i.e. book vouchers).

behavioral priorities. For the ex-ante behavioral priorities, Table 7 below shows the behavioral priorities that each experiment subject had chosen before each game started and their counts by game and by person. As there was no constraint on how many times experiment subjects should choose "self" or "community" in the five games, "self" was selected 37 times and "community" 23 times if counted for all the games. If counted for each game, Game I had 11 self-oriented persons and only 1 community-oriented person, but Games II–V had 5 or 7 self-oriented persons and the remainder were community-oriented, which shows no particular tendency through all the games.

Table 7 Behavioral Priorities chosen ex ante by Experiment Subjects

	Game I	Game II	Game III	Game IV	Game V	Self-oriented	Community-oriented
Consumer A	Self	Self	Community	Self	Self	4 games	1 game
Consumer B	Self	Community	Self	Community	Community	2 games	3 games
Consumer C	Self	Community	Self	Self	Self	4 games	1 game
Consumer D	Self	Community	Community	Self	Community	2 games	3 games
Consumer E	Self	Community	Self	Self	Community	3 games	2 games
Consumer F	Self	Self	Community	Self	Self	4 games	1 game
Consumer G	Self	Community	Self	Self	Self	4 games	1 games
Consumer H	Self	Self	Self	Community	Community	3 games	2 games
Consumer I	Self	Community	Self	Community	Self	3 games	2 games
Consumer J	Self	Self	Community	Self	Community	3 games	2 games
Consumer K	Community	Self	Community	Community	Self	2 games	3 games
Consumer L	Self	Community	Self	Community	Self	3 games	2 games
Self-oriented	11 persons	5 persons	7 persons	7 persons	7 persons	37 games	23 games
Community-oriented	1 person	7 persons	5 persons	5 persons	5 persons		

We then attempted to examine the specific behavioral objectives of "self-oriented" and "community-oriented" subjects. In the ex-post questionnaire, we asked their behavioral objectives in the first half and the last half of each game (up to 3 answers per person), which is shown in Figure 4 below. The result shows that many "self-oriented" subjects chose "to earn as much Yen as possible," "to consume as much as possible," and "to do as much par-time job as possible in local shops." On the other hand, many "community-oriented" subjects chose "to consume as much as possible in local shops," "to do as much volunteering as possible in local NPOs," and "to do as much donation as possible in local NPOs." In addition, Tables 8-1–8-5 show actual amounts of activities by each subject.

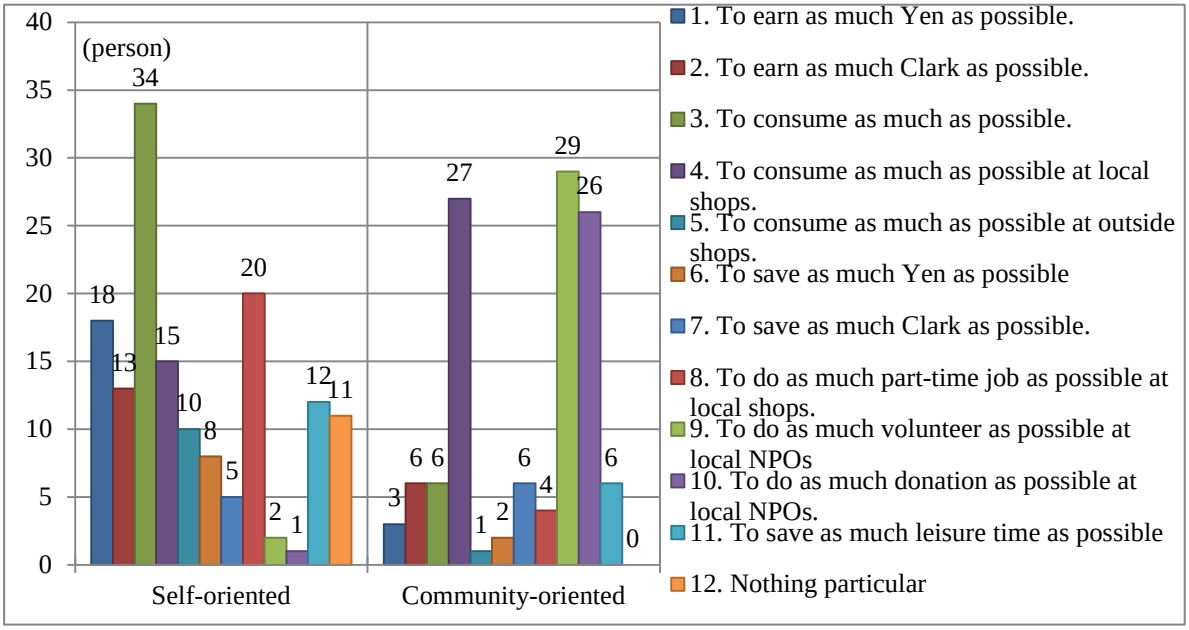

Figure 4 Experiment subjects' behavioral objectives through all the games

Grouped by their ex ante behavioral priorities, the experiment subjects had the following patterns in their amounts of various activities in Games I–V. First, as the characteristics of all the members in each group, the following establish:

For self-oriented consumers:

Consumption in chain stores > *Consumption in local shops* and *Part-time jobs* > *Volunteering*

For community-oriented consumers:

Consumption in chain stores < *Consumption in local shops* and *Part-time jobs* < *Volunteering*

Second, as the characteristics of two groups compared:

Consumption in chain stores by self-oriented consumers > *Consumption in chain stores by community-oriented consumer*

Consumption in local shops by self-oriented consumers > *Consumption in local shops by community-oriented consumer*

Part-time job by self-oriented consumers > *Part-time job by community-oriented consumers* *

Volunteering by self-oriented consumers > *Volunteering by community-oriented consumers* *

Donation by self-oriented consumers < *Donation by community-oriented consumers*

* Valid both in terms of monetary amount and number of hours.

Thus, we could find some contrastive characteristics between the self-oriented and community-oriented groups in their amounts of activities. Especially for Games I–IV, we could find an additional pattern that *Clark purchased by self-oriented consumers* < *Clark purchased by community-oriented consumers*, which did not apply for Game V.

The analysis above is based on experiment subjects' behavioral priorities (self-oriented or community-oriented) chosen before each game started. Then let us examine whether such behavioral priorities were followed in the actual games. The experiment subjects do not necessarily have such consistency that they could follow their own choice of behavioral priorities. In the process of experiencing electronic CCs, it would be possible that behavioral priorities would be different from ex ante choices. Let us analyze both the distribution of subjects' ex ante behavioral priorities and that of ex post senses of "self : community" in the questionnaire. Dividing each game's subjects into two groups by their ex ante choice of behavioral priorities (self-oriented or community-oriented), then Figures 5-1–5-5 show their ex post weights on "self : community" within each group.

Table 8-1 Each agent's balances and accumulative totals of transactions at the end of Game I

Player Name	Income in Yen	Leisure time in hours	Expenses for purchases in Yen	Purchases of Clark	In come from Liquidation in Yen	Liquidation of Clark	Consumption in Yen in chain stores	All consumption in local shops	Consumption in Yen in local shops	Consumption in Clark in local shops	Pay for part-time jobs in Yen	Gratuity for volunteering in Clark	Donations in Clark	Hours for part-time jobs	Hours for volunteering	Hours consumed in chain stores	Hour consumed in local shops	Yen balance	Clark balance	Time balance
Local shop A	0	0	0	0	81,135	-90,150	0	117,850	15,200	102,650	-88,000	0	0	88	0	0	14	8,335	12,500	102
Local shop B	0	0	0	0	114,480	-127,200	0	161,700	26,500	135,200	-89,000	0	0	89	0	0	10	51,980	8,000	99
Local NPO A	0	0	0	0	0	0	0	0	0	0	0	-5,100	12,000	0	86	0	0	0	6,900	86
Local NPO B	0	0	0	0	0	0	0	0	0	0	0	-6,200	9,000	0	59	0	0	0	2,800	59
Chain store A	0	0	0	0	0	0	78,900	0	0	0	0	0	0	0	0	8	0	78,900	0	8
Chain store B	0	0	0	0	0	0	221,300	0	0	0	0	0	0	0	0	22	0	221,300	0	22
Consumer A	50,000	48	-20,200	22,220	0	0	-61,800	-22,500	0	-22,500	32,000	1,200	0	-32	-12	-2	-2	0	920	0
Consumer B	50,000	48	-15,000	16,500	0	0	-41,200	-16,000	0	-16,000	10,000	500	0	-10	-5	-7	0	3,800	1,000	26
Consumer C	50,000	48	-20,000	22,000	0	0	-6,800	-10,700	0	-10,700	0	450	0	0	-3	-2	0	23,200	11,750	43
Consumer D	50,000	48	-10,000	11,000	0	0	-20,000	-7,500	0	-7,500	8,000	0	0	-8	0	0	0	28,000	3,500	40
Consumer E	50,000	48	-23,800	26,180	0	0	-26,200	-27,450	0	-27,450	0	1,600	0	0	-30	-2	-2	0	330	14
Consumer F	50,000	48	-7,280	8,008	0	0	-32,600	-6,000	0	-6,000	0	0	-2,000	0	0	-4	-2	10,120	8	42
Consumer G	50,000	48	-22,500	24,750	0	0	-6,500	-44,500	-23,000	-21,500	20,000	1,800	-1,000	-20	-14	-1	0	18,000	4,050	13
Consumer H	50,000	48	-20,000	22,000	0	0	-8,500	-19,750	-7,200	-12,550	28,000	0	0	-28	0	-4	-6	42,300	9,450	10
Consumer I	50,000	48	-40,000	44,000	0	0	-10,100	-30,650	0	-30,650	2,000	1,750	0	-2	-30	-2	-2	1,900	15,100	12
Consumer J	50,000	48	-30,000	33,000	0	0	-52,600	-33,050	0	-33,050	38,000	800	0	-38	-8	0	-2	5,400	750	0
Consumer K	50,000	48	-50,000	55,000	0	0	0	-31,450	0	-31,450	3,000	2,900	-18,000	-3	-41	0	-4	3,000	8,450	0
Consumer L	50,000	48	-20,000	22,000	0	0	-33,900	-30,000	-11,500	-18,500	36,000	300	0	-36	-2	-6	-4	20,600	3,800	0
Issuer	0	0	278,780	-306,658	-195,615	217,350	0	0	0	0	0	0	0	0	0	0	0	83,165	-89,308	0
Average of self-oriented consumers	50,000	48	-20,798	22,878	0	0	-27,291	-22,555	-3,791	-18,764	15,818	764	-273	-16	-9	-3	-2	13,938	4,605	18
Average of community-oriented consumers	50,000	48	-50,000	55,000	0	0	0	-31,450	0	-31,450	3,000	2,900	-18,000	-3	-41	0	-4	3,000	8,450	0
Average of all consumers	50,000	17	-23,232	25,555	0	0	-25,017	-23,296	-3,475	-19,821	14,750	942	-1,750	-15	-12	-3	-2	48	13,027	4,926

* Shaded consumers are "community-oriented".

Table 8-2 Each agent's balances and accumulative totals of transactions at the end of Game II

Player Name	Income in Yen	Leisure time in hours	Expenses for purchases in Yen	Purchases of Clark	In come from Liquidation in Yen	Liquidation of Clark	Consumption in Yen in chain stores	All consumption in local shops	Consumption in Yen in local shops	Consumption in Clark in local shops	Pay for part-time jobs in Yen	Gratuity for volunteering in Clark	Donations in Clark	Hours for part-time jobs	Hours for volunteering	Hours consumed in chain stores	Hour consumed in local shops	Yen balance	Clark balance	Time balance
Local shop A	0	0	0	0	143,100	-159,000	0	189,400	25,400	164,000	-58,000	0	0	58	0	0	16	110,500	5,000	74
Local shop B	0	0	0	0	138,060	-153,400	0	202,400	11,500	190,900	-115,000	0	0	115	0	0	8	34,560	37,500	123
Local NPO A	0	0	0	0	0	0	0	0	0	0	0	-8,050	50,000	0	128	0	0	0	41,950	128
Local NPO B	0	0	0	0	0	0	0	0	0	0	0	-8,800	55,000	0	84	0	0	0	46,200	84
Chain store A	0	0	0	0	0	0	25,600	0	0	0	0	0	0	0	0	0	0	25,600	0	0
Chain store B	0	0	0	0	0	0	159,800	0	0	0	0	0	0	0	0	55	0	159,800	0	55
Consumer A	50,000	48	-4,000	4,400	0	0	-70,000	-4,400	0	-4,400	24,000	0	0	-24	0	-24	0	0	0	0
Consumer B	50,000	48	-53,100	58,410	0	0	0	-68,000	-12,900	-55,100	16,000	600	0	-16	-6	0	-4	0	3,910	22
Consumer C	50,000	48	-25,000	27,500	0	0	-3,000	-7,500	0	-7,500	0	1,600	-3,000	0	-30	0	0	22,000	18,600	18
Consumer D	50,000	48	-2,100	2,310	0	0	0	-13,000	-11,500	-1,500	0	1,850	-2,000	0	-17	0	0	36,400	660	31
Consumer E	50,000	48	-46,200	50,820	0	0	-3,800	-48,500	0	-48,500	0	2,900	-5,000	0	-41	-3	-4	0	220	0
Consumer F	50,000	48	-7,000	7,700	0	0	-32,600	-8,000	0	-8,000	0	300	0	0	-3	-2	-6	10,400	0	37
Consumer G	50,000	48	-85,000	93,500	0	0	0	-41,500	0	-41,500	35,000	1,500	-50,000	-35	-12	0	0	0	3,500	1
Consumer H	50,000	48	-50,000	55,000	0	0	0	-47,000	-11,500	-35,500	32,000	1,700	-20,000	-32	-14	0	-2	20,500	1,200	0
Consumer I	50,000	48	-27,000	29,700	0	0	0	-11,850	0	-11,850	0	2,750	-18,000	0	-41	0	-4	23,000	2,600	3
Consumer J	50,000	48	-64,000	70,400	0	0	-6,000	-69,300	0	-69,300	25,000	1,600	0	-25	-17	-2	-4	5,000	2,700	0
Consumer K	50,000	48	0	0	0	0	-70,000	-1,150	-1,000	-150	21,000	450	0	-21	-3	-24	0	0	300	0
Consumer L	50,000	48	-70,000	77,000	0	0	0	-71,600	0	-71,600	20,000	1,600	-7,000	-20	-28	0	0	0	0	0
Issuer	0	0	433,400	-476,740	-281,160	312,400	0	0	0	0	0	0	0	0	0	0	0	152,240	-164,340	0
Average of self-oriented consumers	50,000	48	-25,000	27,500	0	0	-35,720	-25,970	-2,500	-23,470	20,400	810	-4,000	-20	-7	-10	-2	7,180	840	7
Average of community-oriented consumers	50,000	48	-44,057	48,463	0	0	-971	-37,421	-3,486	-33,936	10,143	1,829	-12,143	-10	-25	0	-2	11,629	4,213	11
Average of all consumers	50,000	48	-36,117	39,728	0	0	-15,450	-32,650	-3,075	-29,575	14,417	1,404	-8,750	-14	-18	-5	-2	9,775	2,808	9

* Shaded consumers are "community-oriented".

Table 8-3 Each agent's balances and accumulative totals of transactions at the end of Game III

Player Name	Income in Yen	Leisure time in hours	Expenses for purchases in Yen	Purchases of Clark	In come from Liquidation in Yen	Liquidation of Clark	Consumption in Yen in chain stores	All consumption in local shops	Consumption in Yen in local shops	Consumption in Clark in local shops	Pay for part-time jobs in Yen	Gratuity for volunteering in Clark	Donations in Clark	Hours for part-time jobs	Hours for volunteering	Hours consumed in chain stores	Hour consumed in local shops	Yen balance	Clark balance	Time balance
Local shop A	0	0	0	0	76,080	-95,100	0	127,400	4,000	123,400	-63,000	0	0	63	0	0	14	17,080	28,300	77
Local shop B	0	0	0	0	139,600	-174,500	0	284,000	15,000	269,000	-120,000	0	0	120	0	0	0	34,600	94,500	120
Local NPO A	0	0	0	0	0	0	0	0	0	0	0	-5,700	43,000	0	109	0	0	0	37,300	109
Local NPO B	0	0	0	0	0	0	0	0	0	0	0	-8,200	30,000	0	81	0	0	0	21,800	81
Chain store A	0	0	0	0	0	0	48,900	0	0	0	0	0	0	0	0	6	0	48,900	0	6
Chain store B	0	0	0	0	0	0	240,900	0	0	0	0	0	0	0	0	52	0	240,900	0	52
Consumer A	50,000	48	-72,700	87,240	0	0	-21,300	-86,150	0	-86,150	44,000	0	-1,000	-44	0	0	-4	0	90	0
Consumer B	50,000	48	-5,800	6,960	0	0	-64,200	-4,450	0	-4,450	20,000	0	0	-20	0	-2	-2	0	2,510	24
Consumer C	50,000	48	-47,000	56,400	0	0	-2,700	-43,000	0	-43,000	0	800	-10,000	0	-8	0	0	300	4,200	40
Consumer D	50,000	48	-6,600	7,920	0	0	0	-27,000	-17,000	-10,000	0	2,100	0	0	-35	0	0	26,400	20	13
Consumer E	50,000	48	-46,000	55,200	0	0	-5,000	-57,600	0	-57,600	1,000	2,400	0	-1	-38	-2	-2	0	0	5
Consumer F	50,000	48	-3,834	4,601	0	0	-34,800	-5,000	0	-5,000	0	2,200	-1,000	0	-19	-4	0	11,366	801	25
Consumer G	50,000	48	-55,011	66,013	0	0	-20,000	-53,000	0	-53,000	48,000	0	-3,000	-48	0	0	0	22,989	10,013	0
Consumer H	50,000	48	0	0	0	0	-70,000	-2,000	-2,000	0	24,000	0	0	-24	0	-24	0	2,000	0	0
Consumer I	50,000	48	-43,500	52,200	0	0	-1,800	-49,300	0	-49,300	12,000	750	0	-12	-6	-2	-4	16,700	3,650	24
Consumer J	50,000	48	-60,000	72,000	0	0	0	-34,100	0	-34,100	10,000	2,550	-40,000	-10	-38	0	0	0	450	0
Consumer K	50,000	48	-50,000	60,000	0	0	0	-45,000	0	-45,000	0	3,100	-18,000	0	-46	0	-2	0	100	0
Consumer L	50,000	48	-4,000	4,800	0	0	-70,000	-4,800	0	-4,800	24,000	0	0	-24	0	-24	0	0	0	0
Issuer	0	0	394,445	-473,334	-215,680	269,600	0	0	0	0	0	0	0	0	0	0	0	178,765	-203,734	0
Average of self-oriented consumers	50,000	48	-28,759	34,510	0	0	-33,386	-30,593	-286	-30,307	18,429	564	-1,857	-18	-7	-8	-1	5,998	2,910	13
Average of community-oriented consumers	50,000	48	-38,627	46,352	0	0	-11,220	-39,450	-3,400	-36,050	10,800	1,990	-12,000	-11	-28	-1	-1	7,553	292	8
Average of all consumers	50,000	48	-32,870	39,445	0	0	-24,150	-34,283	-1,583	-32,700	15,250	1,158	-6,083	-15	-16	-5	-1	6,646	1,820	11

* Shaded consumers are "community-oriented".

Table 8-4 Each agent's balances and accumulative totals of transactions at the end of Game IV

Player Name	Income in Yen	Leisure time in hours	Expenses for purchases in Yen	Purchases of Clark	In come from Liquidation in Yen	Liquidation of Clark	Consumption in Yen in chain stores	All consumption in local shops	Consumption in Yen in local shops	Consumption in Clark in local shops	Pay for part-time jobs in Yen	Gratuity for volunteering in Clark	Donations in Clark	Hours for part-time jobs	Hours for volunteering	Hours consumed in chain stores	Hour consumed in local shops	Yen balance	Clark balance	Time balance
Local shop A	0	0	0	0	126,960	-158,700	0	267,900	12,400	255,500	-99,000	0	0	99	0	0	10	40,360	96,800	109
Local shop B	0	0	0	0	152,640	-190,800	0	285,800	0	285,800	-120,000	0	0	120	0	0	6	32,640	95,000	126
Local NPO A	0	0	0	0	0	0	0	0	0	0	0	-6,500	52,000	0	101	0	0	0	45,500	101
Local NPO B	0	0	0	0	0	0	0	0	0	0	0	-7,700	34,000	0	72	0	0	0	26,300	72
Chain store A	0	0	0	0	0	0	30,800	0	0	0	0	0	0	0	0	10	0	30,800	0	10
Chain store B	0	0	0	0	0	0	126,000	0	0	0	0	0	0	0	0	27	0	126,000	0	27
Consumer A	50,000	48	-98,000	117,600	0	0	0	-116,200	0	-116,200	48,000	0	-1,000	-48	0	0	0	0	400	0
Consumer B	50,000	48	-69,600	83,520	0	0	0	-86,100	-9,400	-76,700	29,000	0	-5,000	-29	0	0	-4	0	1,820	15
Consumer C	50,000	48	-50,000	60,000	0	0	0	-41,500	0	-41,500	0	800	-7,000	0	-8	0	0	0	12,300	40
Consumer D	50,000	48	-20,000	24,000	0	0	0	-23,000	0	-23,000	7,000	500	0	-7	-6	0	-2	37,000	1,500	33
Consumer E	50,000	48	0	0	0	0	-71,000	-1,000	-1,000	0	22,000	0	0	-22	0	-24	-2	0	0	0
Consumer F	50,000	48	-4,504	5,405	0	0	-31,800	-6,000	0	-6,000	0	750	0	0	-5	-10	-2	13,696	155	31
Consumer G	50,000	48	-22,010	26,412	0	0	-50,000	-25,000	0	-25,000	37,000	0	0	-37	0	0	0	14,990	1,412	11
Consumer H	50,000	48	-30,000	36,000	0	0	-4,000	-4,500	-2,000	-2,500	9,000	3,750	-37,000	-9	-34	-3	-2	23,000	250	0
Consumer I	50,000	48	-43,000	51,600	0	0	0	-15,400	0	-15,400	6,000	2,950	-13,000	-6	-39	0	-2	13,000	26,150	1
Consumer J	50,000	48	-74,000	88,800	0	0	0	-89,500	0	-89,500	24,000	1,000	0	-24	-24	0	0	0	300	0
Consumer K	50,000	48	-56,000	67,200	0	0	0	-56,500	0	-56,500	6,000	2,650	-13,000	-6	-40	0	-2	0	350	0
Consumer L	50,000	48	-81,000	97,200	0	0	0	-89,000	0	-89,000	31,000	1,800	-10,000	-31	-17	0	0	0	0	0
Issuer	0	0	548,114	-657,737	-279,600	349,500	0	0	0	0	0	0	0	0	0	0	0	268,514	-308,237	0
Average of self-oriented consumers	50,000	48	-38,359	46,031	0	0	-21,829	-43,171	-143	-43,029	19,714	436	-1,143	-20	-6	-5	-1	9,384	2,295	16
Average of community-oriented consumers	50,000	48	-55,920	67,104	0	0	-800	-50,300	-2,280	-48,020	16,200	2,230	-15,600	-16	-26	-1	-2	7,200	5,714	3
Average of all consumers	50,000	48	-45,676	54,811	0	0	-13,067	-46,142	-1,033	-45,108	18,250	1,183	-7,167	-18	-14	-3	-1	8,474	3,720	11

* Shaded consumers are "community-oriented".

Table 8-5 Each agent's balances and accumulative totals of transactions at the end of Game V

Player Name	Income in Yen	Leisure time in hours	Expenses for purchases in Yen	Purchases of Clark	In come from Liquidation in Yen	Liquidation of Clark	Consumption in Yen in chain stores	All consumption in local shops	Consumption in Yen in local shops	Consumption in Clark in local shops	Pay for part-time jobs in Yen	Gratuity for volunteering in Clark	Donations in Clark	Hours for part-time jobs	Hours for volunteering	Hours consumed in chain stores	Hour consumed in local shops	Yen balance	Clark balance	Time balance
Local shop A	0	0	0	0	76,415	-89,900	0	200,000	29,000	171,000	-58,000	0	0	58	0	0	20	47,415	81,100	78
Local shop B	0	0	0	0	202,810	-238,600	0	271,600	15,000	256,600	-146,000	0	0	146	0	0	4	71,810	18,000	150
Local NPO A	0	0	0	0	0	0	0	0	0	0	0	-7,800	20,000	0	175	0	0	0	12,200	175
Local NPO B	0	0	0	0	0	0	0	0	0	0	0	-3,100	54,000	0	29	0	0	0	50,900	29
Chain store A	0	0	0	0	0	0	81,300	0	0	0	0	0	0	0	0	6	0	81,300	0	6
Chain store B	0	0	0	0	0	0	115,700	0	0	0	0	0	0	0	0	12	0	115,700	0	12
Consumer A	50,000	48	-30,200	34,730	0	0	-63,800	-33,400	0	-33,400	44,000	0	-1,000	-44	0	0	-4	0	330	0
Consumer B	50,000	48	-71,000	81,650	0	0	0	-76,800	0	-76,800	21,000	0	-4,000	-21	0	0	0	0	850	27
Consumer C	50,000	48	-22,000	25,300	0	0	-26,500	-11,500	0	-11,500	0	1,000	-10,000	0	-24	0	0	1,500	4,800	24
Consumer D	50,000	48	-15,000	17,250	0	0	0	-25,300	-11,500	-13,800	5,000	1,500	-2,000	-5	-29	0	0	28,500	2,950	14
Consumer E	50,000	48	-21,500	24,725	0	0	0	-45,900	-28,500	-17,400	0	2,850	-10,000	0	-40	0	-8	0	175	0
Consumer F	50,000	48	-7,261	8,351	0	0	-35,000	-8,800	0	-8,800	0	450	0	0	-4	-8	-2	7,739	1	34
Consumer G	50,000	48	-82,690	95,103	0	0	0	-31,850	0	-31,850	33,000	0	-20,000	-33	0	0	-4	310	43,253	11
Consumer H	50,000	48	-33,921	39,011	0	0	0	-34,000	-4,000	-30,000	0	2,000	-11,000	0	-48	0	0	12,079	11	0
Consumer I	50,000	48	-38,000	43,700	0	0	-1,800	-25,050	0	-25,050	13,000	1,100	0	-13	-11	-2	-6	23,200	19,750	16
Consumer J	50,000	48	-40,000	46,000	0	0	-10,000	-32,000	0	-32,000	0	2,000	-16,000	0	-48	0	0	0	0	0
Consumer K	50,000	48	-47,826	55,000	0	0	-50,000	-55,000	0	-55,000	48,000	0	0	-48	0	0	0	174	0	0
Consumer L	50,000	48	-80,000	92,000	0	0	-9,900	-92,000	0	-92,000	40,000	0	0	-40	0	-8	0	100	0	0
Issuer	0	0	489,398	-562,820	-279,225	328,500	0	0	0	0	0	0	0	0	0	0	0	210,173	-234,320	0
Average of self-oriented consumers	50,000	48	-43,997	50,598	0	0	-26,714	-36,800	0	-36,800	25,429	364	-4,429	-25	-6	-3	-2	4,718	9,733	12
Average of community-oriented consumers	50,000	48	-36,284	41,727	0	0	-2,000	-42,800	-8,800	-34,000	5,200	1,670	-8,600	-5	-33	0	-2	8,116	797	8
Average of all consumers	45,455	44	9,200	-10,580	-25,384	29,864	-12,109	-32,855	-4,000	-28,855	12,636	991	-6,273	-13	-19	-2	-2	25,798	-14,853	9

* Shaded consumers are "community-interested".

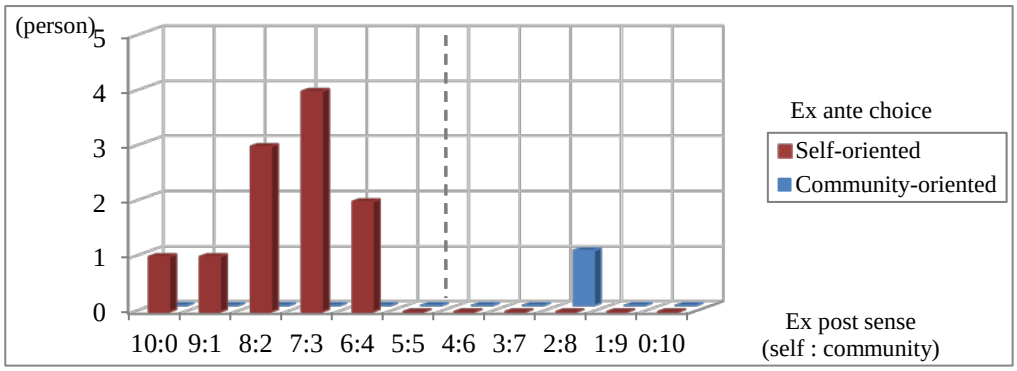

Figure 5-1 Ex-ante choices and ex-post senses of subjects' behavioral priorities (Game I)

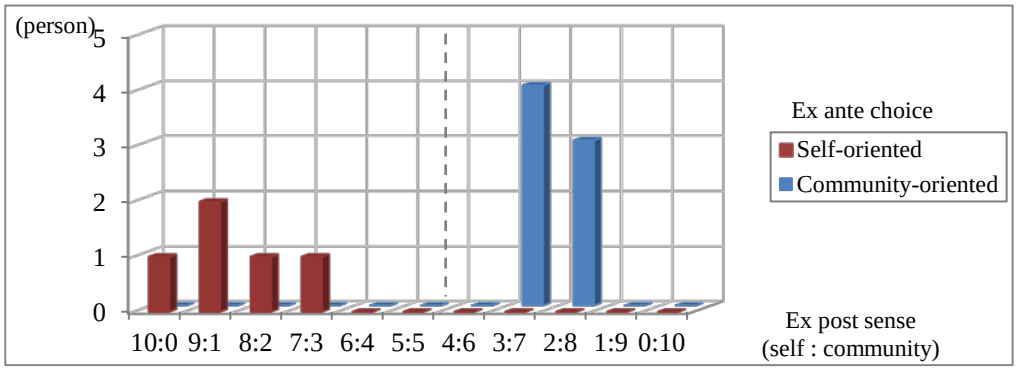

Figure 5-2 Ex-ante choices and ex-post senses of subjects' behavioral priorities (Game II)

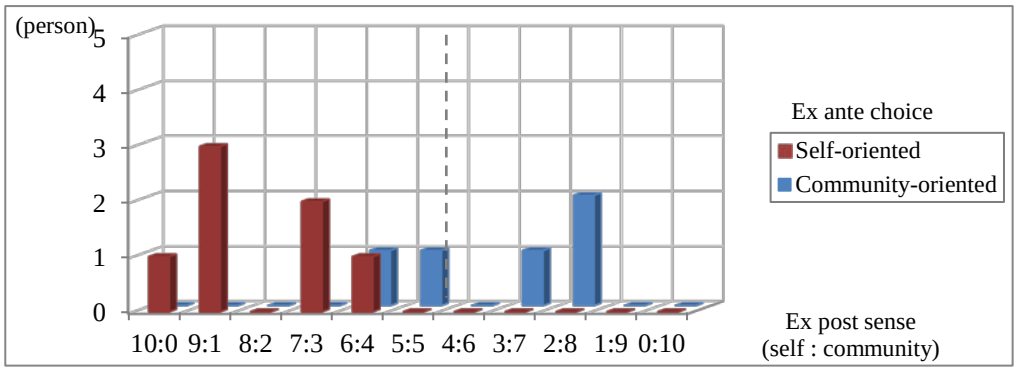

Figure 5-3 Ex-ante choices and ex-post senses of subjects' behavioral priorities (Game III)

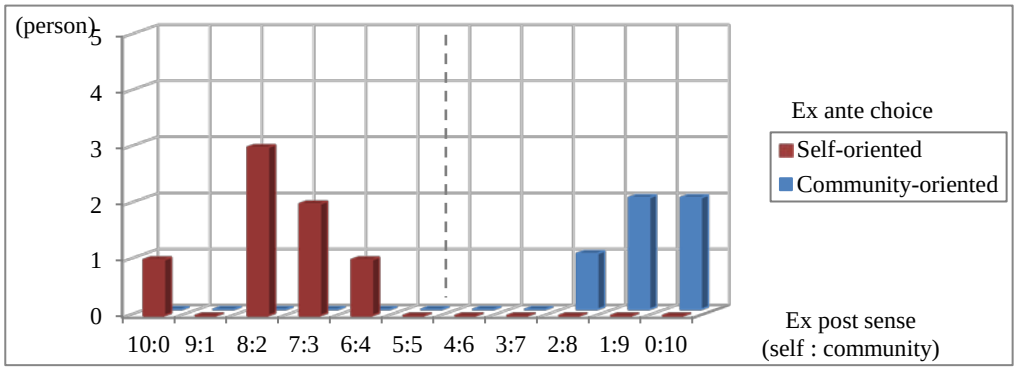

Figure 5-4 Ex-ante choices and ex-post senses of subjects' behavioral priorities (Game IV)

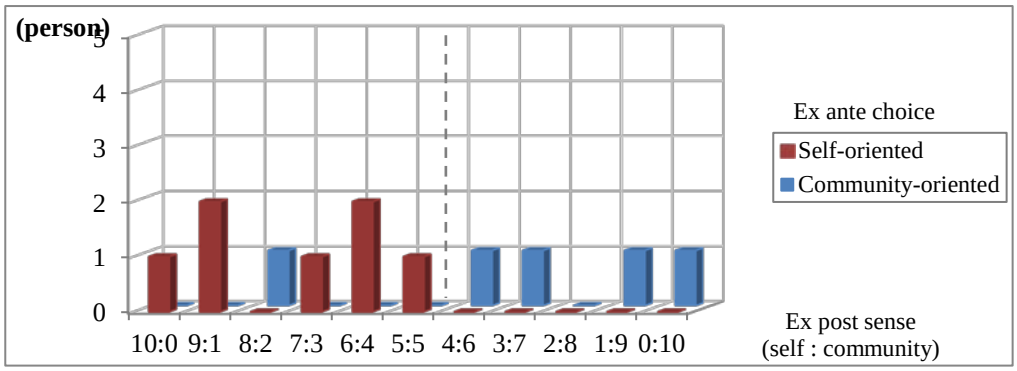

Figure 5-5 Ex-ante choices and ex-post senses of subjects' behavioral priorities (Game V)

In these graphs, the *extent* to which subjects were "self-oriented" or "community-oriented" seems divergent at least in their ex-post senses. Even in Games II-V, where there seemed no tendency in the ex-ante choices of behavioral priorities, we can find large divergence between games in terms of ex-post distribution of their weights on "self : community." That is, Games I, II, and IV had a large gap between the distributions of "self-oriented" and "community-oriented" groups, while Games III and V had both group's distributions overlapped.[12] Especially the distribution in Game V was uniformly scattered and flat. To grasp this point quantitatively, let us define $b\ (0 \leq b \leq 10)$ when "self : community = a : b" as "community priority," and calculate its average for all the experiment subjects in each game. Table 9 below shows the correlation between the average of "community priority" of experiment subjects in each game and their amounts of activities.

Table 9 The correlation of "community priority" and the amounts of activities in each game

Game Progress	Average of "community priority"	Cumulative total of consumers' purchases (in Clark)	Cumulative total of consumers' expenses for purchases (in Yen)	Cumulative total of all consumption in local shops (in Clark and Yen)	Cumulative total of consumption in Clark in local shops (in Clark)	Cumulative total of consumption in Yen in local shops (in Yen)	Cumulative total of pay for part-time jobs in local shops (in Yen)	Cumulative total of donations to local NPOs (in Clark)	Cumulative total of gratitude for volunteering in local NPOs (in Clark)	Cumulative total of consumption in chain stores (in Yen)	Consumption in local shops / Consumption in chain stores	Gratitude for volunteering / Pay for part-time jobs
Game I	2.92	306,658	278,780	279,550	237,850	41,700	177,000	21,000	11,150	298,900	0.070	0.063
Game II	4.92	476,740	433,400	391,800	354,900	36,900	173,000	105,000	16,850	185,400	0.566	0.097
Game III	3.75	473,334	394,445	411,400	392,400	19,000	183,000	73,000	13,900	289,800	0.251	0.076
Game IV	5.17	657,737	548,114	553,700	541,300	12,400	219,000	86,000	14,200	156,800	0.548	0.065
Game V	4.33	562,806	489,388	441,600	397,600	44,000	204,000	74,000	10,900	190,500	0.388	0.053
Correlation coefficient with "community priority"		0.856	0.900*	0.825	0.800	-0.394	0.524	0.902*	0.625	-0.937*	0.992**	-0.291
p-value		0.064	0.037	0.085	0.104	0.512	0.365	0.036	0.259	0.019	0.001	0.635

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

[12] Especially in Games III and IV, one subject who chose community before the relevant game started answered, in the ex-post questionnaire, that he actually put more weight on self than community.

When it comes to the relationship between the experiment subjects' (consumers') community priority and their amounts of each activity, the former had a strong positive correlation with the amount of Clark purchased and the amount of donations in local NPOs, and a strong negative correlation with the amount of consumption in chain stores (local outflow of Yen) (shaded columns in Table 7-1).[13] Especially in Game I, where experiment subjects' community priority was lowest (because 11 of 12 experiment subjects prioritized "self"), note that the cumulative total of consumption inside the community fell below that of consumption outside the community. The experiment subjects seem to have understood that the purchases (charges) of CCs or the donations of CCs in local NPOs would contribute to the community, while the consumption in chain stores would have negative effects on the community. In addition, the ratio between consumption in local shops and consumption in chain stores has a strong positive correlation with experiment subjects' community priority. Based on this fact, they might have thought that consumption inside the community would contribute much more to the community than consumption outside the community.

Then let us look at the correlation coefficient between community priorities and amounts of each activity by consumer in Gamess I–V (Table 10). The community priorities of 9 of 12 subjects (Consumers D, E, F, G, H, I, J, K and L) had a very strong positive correlation with at least either of the donations in local NPOs or the gratuity for volunteering in local NPOs. When they put more weight on the community, the more donation and volunteering they do. The community priorities of 2 of 12 subjects (Consumers B and K) had a very strong negative correlation with consumption in chain stores, which means that if their community priorities get higher, their consumption outside the community would decrease. Especially, consumer B had such a correlation that his amount of Clark purchased and that of consumption in Clark within the community increase at the same time, if his or her community priority gets higher. In this manner, the content of "community-oriented" was actually different from subject to subject.

Here note that there were two persons who had no correlation between their community priority and their amounts of activities (Consumers A and C). These two are the same as those who had strong correlation between the premium rates and amounts of activities through all the games (Table 6). That is, consumer A and C's behaviors were mainly determined by the changes of premium rates and the rest 10 subjects were by their community priority. As an overall tendency in these games, the amounts of each activity was dominated by the community priority. In other words, the dominant factor in this experiment was the community priority.

[13] One of two amounts of activities concerning Clark purchases, that is, "Cumulative total of consumers' purchases (in Clark)" did not have any correlation with community priority. However, this does not necessarily negate the correlation between purchases of CCs and the community priority, because the amount purchased was determined by both Yen expenses and premium rates, the latter of which were different game by game.

Lastly in the next section, let us see the relationship between the methods of displaying aggregate information and the behaviors of experiment subjects.

Table 10 The correlation of "community priority" and the amounts of activities through all games

Correlation coefficient with "community priority" through Games I–V	Cumulative total of consumers' purchases (in Clark)	Cumulative total of consumers' expenses for purchases (in Yen)	Cumulative total of all consumption in local shops (in Clark and Yen)	Cumulative total of consumption in Clark in local shops (in Clark)	Cumulative total of consumption in Yen in local shops (in Yen)	Cumulative total of pay for part-time jobs in local shops (in Yen)	Cumulative total of donations to local NPOs (in Clark)	Cumulative total of gratitude for volunteering in local NPOs (in Clark)	Cumulative total of consumption in chain stores (in Yen)
Consumer A	0.314	0.319	0.307	0.307	-	0.683	0.748	-0.250	-0.18
Consumer B	0.994**	0.997**	0.993**	0.997**	0.526	0.548	0.782	-0.147	-0.976**
Consumer C	-0.465	-0.439	-0.596	-0.596	-	-	-0.588	0.749	-0.272
Consumer D	-0.759	-0.768	0.219	-0.672	0.946*	-0.904*	0.553	0.919*	0.431
Consumer E	0.291	0.330	0.510	0.137	0.655	0.655	0.935*	0.764	0.677
Consumer F	-0.875	-0.868	-0.714	-0.714	-	-	0.161	0.982**	0.420
Consumer G	0.803	0.842	0.107	0.317	-0.281	-0.038	0.989**	0.407	-0.706
Consumer H	0.357	0.303	-0.293	-0.262	-0.354	-0.473	0.938*	0.923*	-0.382
Consumer I	-0.177	-0.289	-0.718	-0.718	-	-0.349	0.915*	0.845	-0.727
Consumer J	0.059	-0.012	-0.517	-0.517	-	-0.871	0.924*	0.869	-0.468
Consumer K	0.685	0.676	0.418	0.422	-0.610	-0.858	0.951*	0.976**	-0.974**
Consumer L	0.603	0.594	0.538	0.545	0.299	-0.396	0.993**	0.994**	-0.689

- not applicable, * Statistically significant at the 5% significance level, ** Statistically significant at the 1% significance level

3.4 The Methods of Displaying Aggregates and Experiment Subjects' Behaviors

In this section, we examine whether the methods of displaying the aggregates (Table 3) have any effect on experiment subjects' behaviors. Figure 6 below shows how many times they referred to the graphs of aggregates in each game (how many times they switched their window to display the aggregates on their PC monitors).

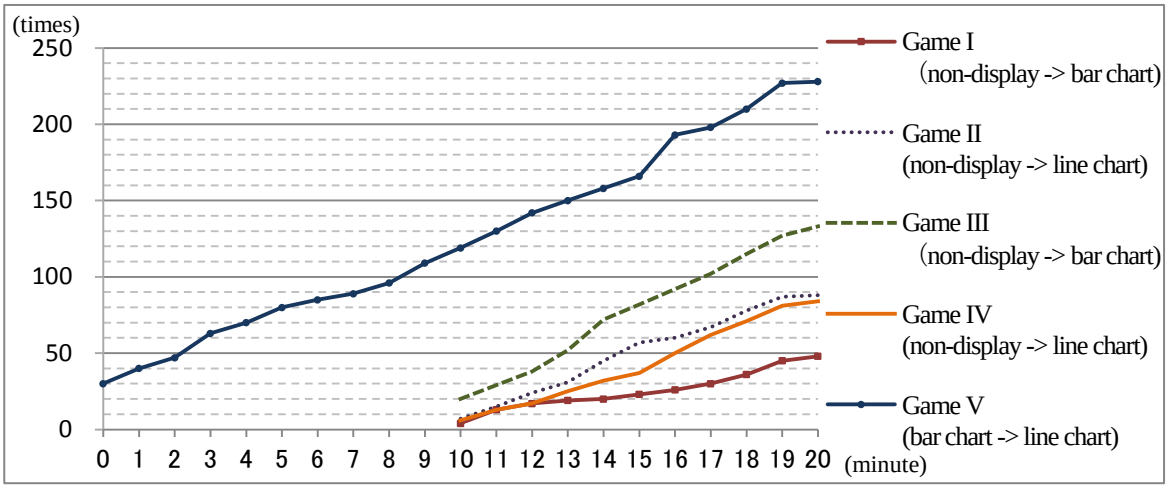

Figure 6 The Access to the Graphs of Aggregates by Experiment Subjects

The methods displaying the graphs changed 10 minutes after each game started, but it seems to have had no effect on the amounts of various activities (Figure 3-1–3-5). Statistically there is no significant correlation between the access counts of the graphs of aggregates and the amounts of various activities (Table 11), and little correlation even by each subject (Table 12). Only 1 of 12 consumers (Consumer A) shows correlation between the access counts of the graphs of aggregates and the amounts of various activities.

Table 11 The correlation of the access to the aggregates and the amounts of activities

Game Progress	Access to the aggregates	Cumulative total of consumers' purchases (in Clark)	Cumulative total of consumers' expenses for purchases (in Yen)	Cumulative total of all consumption in local shops (in Clark and Yen)	Cumulative total of consumption in Clark in local shops (in Clark)	Cumulative total of consumption in Yen in local shops (in Yen)	Cumulative total of pay for part-time jobs in local shops (in Yen)	Cumulative total of donations to local NPOs (in Clark)	Cumulative total of gratitude for volunteering in local NPOs (in Clark)	Cumulative total of consumption in chain stores (in Yen)	Consumption in local shops / Consumption in chain stores	Gratitude for volunteering / Pay for part-time jobs
Game I	48	306,658	278,780	279,550	217,350	195,615	177,000	21,000	11,150	298,900	0.935	0.063
Game II	88	476,740	433,400	391,800	312,400	281,160	173,000	105,000	16,850	185,400	2.113	0.097
Game III	133	473,334	394,445	411,400	269,600	215,680	183,000	73,000	13,900	289,800	1.420	0.076
Game IV	84	657,737	548,114	553,700	349,500	279,600	219,000	86,000	14,200	156,800	3.531	0.065
Game V	228	562,806	489,388	441,600	328,500	279,225	204,000	74,000	10,900	190,500	2.318	0.053
Correlation coefficient with the access to the aggregates		0.426	0.440	0.305	0.436	0.398	0.345	0.270	-0.353	-0.248	0.167	-0.403
p-value		0.475	0.458	0.618	0.463	0.618	0.569	0.661	0.560	0.688	0.788	0.501

Table 12 The correlation of the access to the aggregates and the activities through all games

Correlation coefficient with access to the aggregates through Games I–V	Cumulative total of consumers' purchases (in Clark)	Cumulative total of consumers' expenses for purchases (in Yen)	Cumulative total of all consumption in local shops (in Clark and Yen)	Cumulative total of consumption in Clark in local shops (in Clark)	Cumulative total of consumption in Yen in local shops (in Yen)	Cumulative total of pay for part-time jobs in local shops (in Yen)	Cumulative total of donations to local NPOs (in Clark)	Cumulative total of gratitude for volunteering in local NPOs (in Clark)	Cumulative total of consumption in chain stores (in Yen)
Consumer A	-0.913*	-0.909*	-0.909*	-0.909*	-	-0.819	-0.866	0.707	0.880*
Consumer B	0.441	0.456	0.351	-	-0.324	0.205	0.383	-0.448	-0.324
Consumer C	-0.086	-0.113	0.083	0.083	-	-	0.185	-0.843	0.519
Consumer D	0.254	0.285	0.335	0.114	0.252	0.198	0.469	0.123	-0.051
Consumer E	0.681	0.652	0.736	0.694	0.030	-0.793	-0.058	0.586	-0.698
Consumer F	0.508	0.430	0.723	0.723	-	-	-0.375	-0.189	0.634
Consumer G	0.758	0.736	-0.438	0.200	-0.715	0.322	0.400	-0.584	-0.223
Consumer H	0.090	-0.072	0.231	0.360	-0.330	-0.756	-0.088	0.171	-0.040
Consumer I	-0.174	-0.150	-0.301	-0.301	-	0.391	-0.236	-0.198	-0.074
Consumer J	-0.098	-0.145	-0.422	-0.422	-	-0.962*	0.574	0.679	-0.426
Consumer K	-0.319	-0.337	-0.013	-0.018	0.259	0.792	-0.743	-0.780	0.719
Consumer L	0.036	0.009	0.004	0.087	-0.657	0.138	-0.273	-0.444	0.343

- not applicable, * Statistically significant at the 5% significance level

Perhaps, experiment subjects' *frequency* of looking at the aggregates is one thing, and the *extent* to which they understand and pay attention to the aggregates another. Mechanical counts of views might be inadequate for the latter criterion.

In the ex-post questionnaire, we asked participants their top three reasons to pay attention to the bar charts of aggregates (in Games I, III, and V) and to the line charts of aggregates (in Games II, IV, and V) and obtained the following results (Figure 7 and 8).

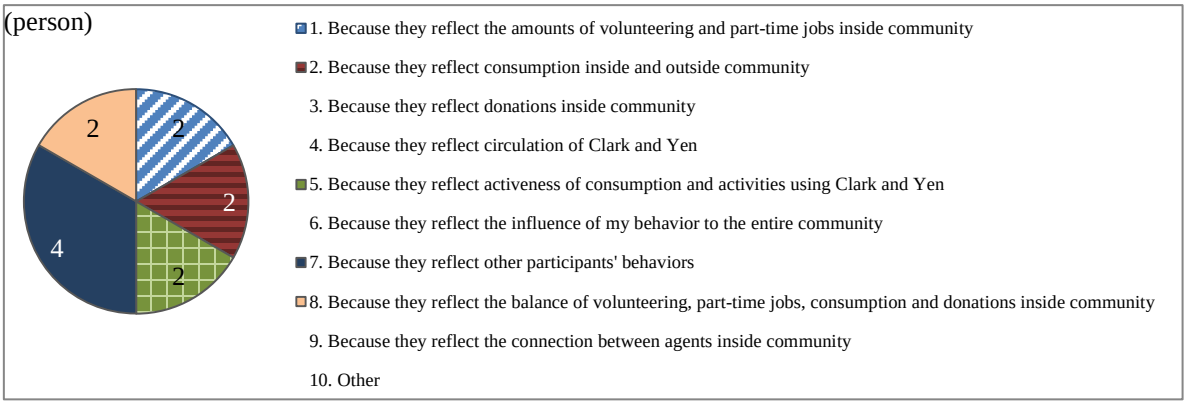

Figure 7 Reasons to focus on bar charts (up to 3 answers per person)

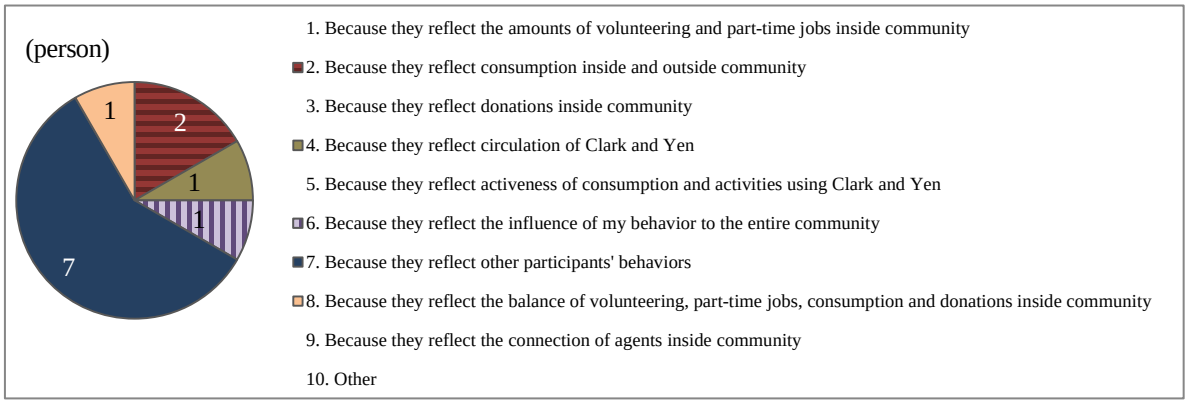

Figure 8 Reasons to focus on line charts (up to 3 answers per person)

According to these figures, the most popular reason to focus on bar charts and line charts was "7. Because they reflect other participants' behaviors." More number of people chose this reason in the case of line charts than bar charts. Experiment subjects might have considered that line charts would be more suitable to observe other participants' *tendency* than bar charts, because the former show diachronic changes while the latter only show temporal information on the situation in the community.

Lastly, let us look at the relationship between participants' ex ante chosen behavioral objectives and the aggregates. Figure 9 below shows which aggregate the experiment subjects focused on in each game. The number of participants who answered "Nothing particular" was

much larger in the group of self-oriented participants than in the group of community-oriented participants. Therefore, it could be said that these 11 kinds of aggregates were more useful for the community-oriented participants than self-oriented participants. In addition, self-oriented participants focused evenly on various aggregates, while more than 10 community-oriented participants focused especially on several aggregates such as “Cumulative total of donation to local NPOs” and “Cumulative total of gratitude for volunteering in local NPOs.” These two aggregates correspond to the popular behavioral objectives seen in community-oriented participants, that is, “To do as much donation as possible in local NPOs” and “To do as much volunteer work as possible in local NPOs” (Figure 4).

Figure 10 below shows which aggregate participants focused on through all the games. Compared to community-oriented participants, self-oriented participants focused more intensively on “My balance of Yen,“ “My balance of Clark,” and “My hours of leisure time.” This suggests that they were more interested in the status of themselves rather than that of the entire community. This result coincides with the analysis above.

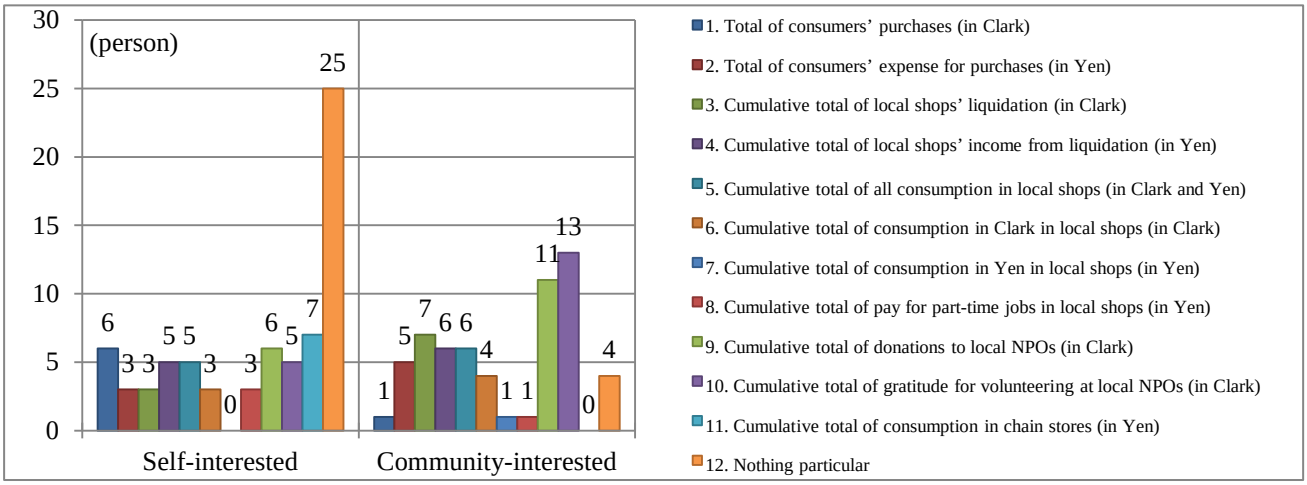

Figure 9 The aggregates focused on by experiment subjects through all the games

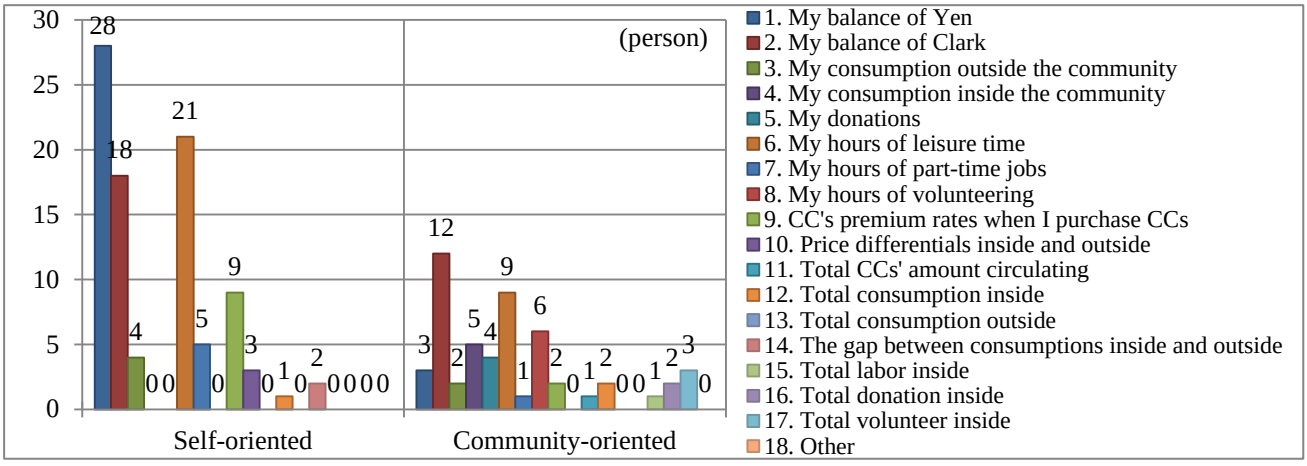

Figure 10 The indexes focused on by experiment subjects through all the games

4. Conclusion

Up to this point, we examined CC's premium rates, participants' behavioral priorities (community priorities) and access counts of the graph of aggregates. The most influential factor determining the extent of activities was whether participants prioritize community over self-interest rather than CC's premium rates or access to the aggregate information. In this regard, however, participants' specific activities induced by those factors had several patterns and 2 of 12 participants' activities were dominated by CC's premium rates rather than the priority they give to community. As for the factor of access to the aggregate information, only 1 of 12 participants had correlation between his activities and his access to the graphs of aggregates, but more relevant factor in this regard would be which specific information the participants focused on.

Under the institutional structure of the virtual CC community, participants that display such a simple behavioral priority (to self or to the community) could exhibit certain suitable behaviors to meet their objectives, understanding the specific institutional structure. The ex-post questionnaire survey reveals that the aggregate information on activities was relatively useful for community-oriented participants. However, what we could demonstrate about the aggregates in this experiment were just correspondence relations between the aggregates and participants' behavioral objectives, not causal relations between the non-display or display of the aggregates and the participants' consciousness and behavior.[14]

These results indicate that the effect of increasing premium rates would be limited for CC users balancing between self and community. Because participants differ in the extent of priority they give to community, it is important to invite various actors to join the community and provide extensive information on activities within the community to them, thereby facilitating various channels of distribution of CCs and allowing them to contribute to the community in various ways. In so doing, the aggregate information, which expresses the institutional contexts of CCs, would help participants to understand the structure of communities, bring out their attention to the other participants, and activate the transactions between them.

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[14] One reason might be that subjects make their consumption plan at the game start; if so, even if we changed the method of displaying the aggregates 10 minutes after the game had started and they adequately recognized the change, it would hardly affect their consumption behavior in the last half of the game.

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