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The Short-term Impact of an Item-based Loyalty Program

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***Abstract*—Given the prevalence of loyalty programs' implementation in service industries, in order to create a difference in the eyes of the customer from other competitors, examining new loyalty program designs become more and more important for most firms. Compare with Zhang and Breugelmans' research of the item-based loyalty program (IBLP), this research studies a more complicated IBLP design, in which customers can earn different extra points for purchases made on different items. The main purpose of this research is to examine the short-term impact of items with different points in this new IBLP design on different types of customers' purchase behavior. Using data from a Japanese grocery store chain, this study shows that those customers who were heavy customers at the beginning of the IBLP are more affected by this new IBLP design. Then, instead of higher-point items, a middle-level-point, 25-point items has the highest impact on customers' purchase behavior. These findings suggest this special tactic can enhance the value of firm's loyalty program, and help managers to further improve the effect of the IBLP by arranging more targeted items to different types of customers.**

Keywords- loyalty program; IBLP; customer purchase behavior; short-term impact analysis

I. INTRODUCTION

Nowadays, loyalty programs are playing a very important role in service industries as a part of stores' customer relationship management strategy. In Japan, 11 different industries (include credit card company, gas station, phone company, super market, etc.) issue reward points to those customers who join in their loyalty programs. Among all these sectors, loyalty programs are more common in those industries that need to identify customers' performances to increase their marketing promotions [1], such as airlines, gas stations and grocery stores. For customers, the loyalty program allows them to earn reward points based on their purchase rates after they join the program. These points can be used as currency or help customers get closer to the redemption thresholds [2][3][4]. For firms, the loyalty program offers them a chance to gain more repeat business, and gather more data that can help firms to develop more targeted promotions [3].

However, given the popularity of the loyalty program in the current marketplace, simply launching this program may fail to achieve its goal of attracting customers. On the contrary, the loyalty program may become a redundant resource to the firm [4]. Recent researches show that the design of the loyalty program plays a critical role in its effectiveness, because it affects customers' enrollment, purchase behavior, attitudinal responses and stores' competitiveness [1][4][5][6]. Thus, in order to improve the appeal of the loyalty program and allow firms to differentiate their programs from others, it becomes more and more important for us to examine new loyalty program designs.

In recent years, researchers have started to examine how new loyalty program designs affect customers' behavior. Zhang and Breugelmans [6] investigates a new retail loyalty program design, called "item-based loyalty program" (IBLP), in which conventional price discounts for each item are replaced by reward points. Their result shows that customers become more responsive to item-based reward point promotions than to price discounts in their store visit decisions.

In this research, we extend Zhang and Breugelmans's work [6] by studying a more complicated IBLP design, in which different items have different points in this IBLP. The purpose of this research is to examine how this new IBLP design may affect customers' purchase behavior. We explore the impact of this new IBLP design from the beginning of such program is implemented. Our study provides several managerial implications that are useful for managers who are contemplating improve the appeal of the IBLP. We organize the remainder of this paper as follows: In the next section, we give an overview on the related issues and offers related empirical hypotheses. Then, we illustrate the background of the IBLP, data set, target customer, model, and the empirical results in Section III and IV. Finally, we discuss the managerial implications and limitations of this research in Section V.

II. LITERATURE REVIEW AND RESEARCH HYPOTHESIS

A "loyalty program", is a long-term program that allows customers to accumulate free rewards or some form of program currency (e.g. points) when they make repeated purchases with a firm [3][4]. Up to now, researchers have addressed many studies about the loyalty program. However, the effectiveness of this program is still debatable. On one hand, some of these researches suggest that loyalty program

can successfully foster customer's loyalty [3] [5] [7] [8] [9]. On the other hand, other researches question the impact of the loyalty program [10] [11].

Based on this, in order to further improve the effect of the loyalty program and differentiate their programs from others, Zhang and Breugelmans's research [6] have proposed a brand new retail loyalty program design, called item-based loyalty program (IBLP). The difference of an IBLP as compared with conventional loyalty programs is that, price discounts for each item are replaced by reward points, which means that customers can earn extra points for purchasing specific items. The purpose of this research is to investigate effects of switching from a conventional loyalty program to the IBLP on customers' purchase behavior which include store visit decision, weekly spending and loyalty program membership conversion decision. However, there are still some unsolved problems. Such as, they did not examine the difference among existing members which is very important to examine whether different types of customers respond the IBLP differently, and which kind of customers are more affected by it. Furthermore, they didn't focus on differences among extra points and how customers will be affected by it.

In this research, the definition of a new IBLP design (A Japanese super-market case: Oasis's IBLP) is that members of the firm can earn different extra points for purchases made on different items. Therefore, as discussed previously, the purpose of this research is to measure the short-term (4 months) impact of the new IBLP design on different types of customers' purchase behavior. In order to fulfill this purpose, we aim to answer two questions.

A. How an IBLP affect different types of customers

In prior research of IBLP, Zhang and Breugelmans [6] are enable to examine different responses of members and non-members to the IBLP, because they use purchase data from an online retailer. As the result, they find out that the "IBLP lead to a 4.8% reduction in total spending by firm's current members, a 15.2% increase in total spending by nonmembers", which means members and non-members do react differently to the IBLP. However, they didn't examine the difference among existing customers' responses. Similar to the loyalty program [3][7], IBLP are also expected to have different impacts on different customers' purchase behavior, which leads to our first hypothesis.

H1. Different types of customers respond differently to Oasis's IBLP.

Over the years, researchers use different ways to identify customers' type, such as socio-demographic [5], variety seeking [12] and firm-specific behavior and attitude [3][4][7][13]. Among all these methods, prior research suggests that "firm-specific behavior are better predictors of customer reaction to a loyalty program" [4]. Thus, this research also uses firm-specific behavior (customers' spending level) to classify customers. Based on customers total spending during the first month after they join the membership, "customers in the top, middle, and bottom thirds were classified as heavy, moderate, and light buyers, respectively" [3]. Thus, in order to prove H1, we need to first examine whether there are differences among three different types of customers' reaction to the IBLP, which leads to this sub-hypothesis:

H1a. Oasis's IBLP affect light, moderate, heavy customers' purchase behavior differently.

On the other hand, based on the prior research [3] and our focus: the impact of different point items in the IBLP on customers' purchase behavior (not the impact of the program itself), in this research, customers' purchase behavior is captured by two variables: IBLP items' purchase incidence and weekly spending of customers on IBLP items. Therefore, if there are differences among three different types of customers, we need to examine exactly which kind of customers, his or her purchase behavior (purchase incidence and weekly spending) are mostly affected by Oasis's IBLP. In this research, customers' purchases made on IBLP items means they can directly earn extra reward points. Thus it is logical to assume that moderate customers also are more affected by the IBLP. Based on that, we bring up the next sub-hypothesis:

H1b. Moderate customers' purchase behavior are more affected by Oasis's IBLP more than heavy and light customers.

B. How different points in IBLP affect customers' purchase behavior differently

There is very few prior research directly examine how different level of points in one loyalty program affect customers' purchase behavior. However, in the literature of coupon elasticity, Kumar and Swaminathan [14] studies whether different face values of coupons affect coupon elasticity differently. They find out that when a coupon has higher face value for the same brand, it has more impact on self-coupon elasticity. From our point of view, the form of coupons' face values are very similar to the form of points in Oasis's IBLP, thus, this research conjecture that points substantially have the similar effect of coupons' face value.

In Oasis's IBLP, different items have different extra points. Like face values of coupons, we also expect that different points may have different impact on customers' purchase behavior. Thus, the next hypothesis we will bring up is:

H2. Different point in Oasis's IBLP affect customers' purchase behavior differently.

In order to prove H2, we need to first examine whether different points have different effect on customers, which brings up the sub-hypothesis:

H2a. Different point in Oasis's IBLP have different impact on customers' purchase behavior.

Then, like we did in H1, we also need to examine exactly which kind of point in IBLP mostly affect customers. Based on the results of coupon elasticity, higher-point items are expected to have more influence on customers' purchase behavior due to customers' desire to maximize monetary savings, which lead to next sub-hypothesis:

H2b. Customers' purchase behavior is more affected by higher point items than lower point items.

III. DATA AND MODEL

A. The Data

1) Background of the IBLP

This research uses a data set that provided by a Japanese grocery chain store (Oasis) that implemented the IBLP. In general, customers can earn one reward point for every two hundred yen spent at the store by the membership card. These points can be used as currency at the ratio of 1 point for 1 yen. Furthermore, this firm operate an item-based loyalty program called "point plus". Under this "point plus", customers can further accumulate item-specific reward points other than points earned on the basis of total spending at the store. In Oasis's IBLP, there are different points' level from 100 to 5 point, and each level includes different items. Some of these items in this IBLP are changed every month. Customers need to enroll in the program to earn reward points, and the membership is free.

2) Background of the data set

Figure 1 shows the time period of this research, which includes two parts: data collection period and store selection period.

First, we present the data collection period. The data set of this research are collected during a 4-month period (January 1, 2016 – April 30, 2016), in which contains an initialization period and an analysis period. As we discussed in the previous section, the reason why we only focus on this 4-month period is that, customers' behavioral loyalty relates to short-term period, and because of the data limitation. This research uses data from the first month (January, 2016) as an initialization period to classify customers and estimate our model using the data from analysis period.

Next, this data set comes from two store in this chain, which just opened before the initialization period (January, 2016). There are two main reason for the selection. First, in order to capture the impact of items in Oasis's IBLP like prior research, we need to use the data from the new store rather than stores that have been already opened for a long time. Second, based on the research of Liu [3] who suggests that whether a customer is familiar with the store may affect the finding of the research, the other merit for choosing newly opened store is that we can avoid learning effect.

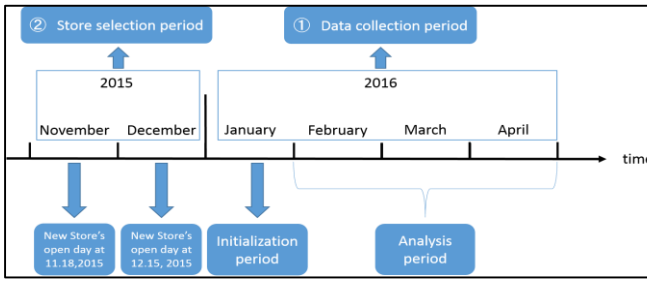

Figure 1. Time period

3) Target customer

This research extract target customer from two stores by using three criteria: (1) Customers who just join the membership of this chain's newly opened store during January 2016, (2) Customers who visit store at least 2 times during January 2016, and (3) Customers who still make at least 1 visit to the store at April (the end of analyze period). The first constraint makes sure that we can use the customers' purchase behavior at the beginning of the IBLP to classify customers. And the last one ensures that we can avoid the impact of customer attrition. Liu's research [3] indicates that it is natural for some customers drop out over time. Since high-value customers are more likely to stay, this may create a self-selection effect. Thus, in order to rule out this possibility, we only focus on customers who are still with the firm at the end of analyze period, which is April, 2016.

As mentioned in section II, in this research we use Liu's method [3] to divide customers into three groups. During the initialization period, customers' spending level in the top, middle, and bottom thirds were classified as heavy, moderate, and light buyers, respectively. As the result, there are 1245 target customers in this sample, which includes 416 light customers, 415 moderate customers, and 414 heavy customers. The number of customers' total spending level in January range from 450 to 68470 yen. Heavy customers' total spending account for 62% of the overall, which is two times more than moderate customers and six times more than light customers. We report relevant basic statistics of different types of customers in Table I. It is apparent that light customers have the largest dispersion.

TABLE I. DESCRIPTIVE STATISTICS OF EACH CUSTOMER'S TOTAL SPENDING LEVEL DURING JANUARY, 2016 (YEN)

Classification	Min	Median	Mean	Max	SD
Heavy	13150	19340	21982	68470	1670
Moderate	6700	9470	9640	13100	1865
Light	450	4150	4050	6670	8834

4) IBLP items

In this section, we focus on different point levels in Oasis's IBLP. In Oasis's IBLP, there are 10 different level of points includes 100, 50, 40, 35, 30, 25, 20, 15, 10 and 5-point. Each point contains different number of items with different unit price. Customers can get corresponding points when they purchase items in different point's levels. Table II indicates the summary statistics of the unit price of IBLP items, in which 25 and 100-point only contain two-unit price. It is apparent that to some extent, higher level of point contain higher-price items. Furthermore, 5 and 10-point have smaller disper-sion. However, based on the result of average number of items at each point level in the IBLP per month, among 10 points' level, 5 and 10-point contain much more items than other levels.

TABLE II. DESCRIPTIVE STATISTICS OF UNIT PRICE OF ITEMS AT EACH POINT LEVEL FROM FEBRUARY TO APRIL, 2016 (YEN)

Point level	Min	Median	Mean	Max	SD
5	68	168	197	898	111
10	88	228	268	898	151
15	108	298	364	980	240
20	118	388	423	980	217
25	288	N/A	807	980	346
30	258	578	883	2480	562
35	Only contain one unit price: 358				
40	Only contain one unit price: 578				
50	428	1180	1020	1398	370
100	998	N/A	1619	1980	540

B. Tobit II Model

In this research, we model IBLP items' purchase incidence and weekly spending on IBLP items by using a "sample selection model", which is also called Tobit II model. Prior research often uses this model to measure customers' purchase behavior[6] [13]. Tobit II model has some merits that does not require the normality assumption, and can handle the longitude data better. More details about Tobit II model are revealed in Greene' s research [15].

We develop a Tobit II model to examine the impact of the IBLP items on customers' purchase behavior, including IBLP items' purchases decision and customers' weekly spending on IBLP items. This model intends to assess how different items in IBLP may affect customers' purchase behavior differently. There are two steps in Tobit II model. We describe each step as follows:

1) ***Step 1****. Probit model (Purchase incidence*) :The first step of Tobit II model is to use a probit model to predict IBLP items' purchase incidence. This research models IBLP items' purchase incidence by assuming that customer i makes a purchase on IBLP items from Oasis's store in week t (Z_{it}) if the utility of doing so (Z_{it}^{*}) is positive:

$$Z_{it} = \begin{cases} 1(Purchase) & if\ Z_{it}^{*} > 0 \\ 0(No\ purchase) & otherwise \end{cases} \quad (1)$$

Let $Z_{it} = 1$ if customer i purchases IBLP items from the store in week t and 0 if otherwise. And let Z_{it}^{*} = customer i's utility of purchasing IBLP items from the store in week t, which is formulated as follows:

$$Z_{it}^{*} = \alpha_0 + \delta_{freq} Freq_{it} + \delta_{trend}\, log(t) + \varepsilon_{it} \quad (2)$$

In this equation, α_0 refers to the baseline IBLP items' purchase incidence. $Freq_{it}$ captures customer i's shop visit frequency in week t. In addition, this research also uses $log(t)$ to represent time trends. This variable can offer "better fit to the data than using a linear time trend" [6]. Finally, ε_{it} is the random error.

2) ***Step 2****. OLS regression model (Weekly spending):* Based on the result in Step 1, if customer i makes a purchase on IBLP items in week t ($Z_{it} = 1$), then we use a linear regression to model y_{it} , the logarithm of weekly spending (in yens) on IBLP items made by customer i in week t. The use of log-transformed spending ensures that the distribution of the dependent variable is closer to normal [6][13].

$$y_{it} = \gamma_0 + \left[\beta_{100p} log(Point_{100it}) + \ \dots \ + \beta_{5p} log(Point_{5it})\right] + \beta_{trend}\, log(t) + \sigma_{it} \quad (3)$$

In this formula, γ_0 is the baseline weekly spending on IBLP items. Then, we include some point-related variables, such as $log(Point_{100it})$. This variable represents the logarithm of spending on 100-point IBLP items. There are 10 point-related variables which corresponding to each point level, range from 100 to 5. We expect coefficients of these variables can capture the impact of different point level of IBLP items on customers' purchase behavior. Time trend is also used in this model. σ_{it} is the random error in this equation.

As we mentioned previously, this research also studies the difference among different types of customers' reaction. Thus, we apply these two models on each type of customer.

IV. RESULT

This research uses a Tobit II model to examine how different points in IBLP affect heavy, moderate and light customers' purchase behavior differently. Probit model is the model we use to predict the probability of purchases made on IBLP items, thus point-related variables can't be used in the probit model. These variables can only be used in OLS regression model for weekly spending.

TABLE III. MODEL RESULTS FOR IBLP ITEMS' PURCHASE INCIDENCE

Variables	Heavy customers	Moderate customers	Light customers
α_0	−0.693***	−0.912***	−1.142***
Shop visit frequency ($Freq_{it}$)	0.175***	0.209***	0.169***
Time Trend [log(t)]	−0.203***	−0.212***	−0.108[n.s.]

We present the model estimation results in Table III and IV. Overall, three types of customers all exhibit some significantly patterns in their IBLP items' purchase incidence and weekly spending on these items. All the coefficients of point-related variables and customers' baseline purchase behavior are significant. On the other hand, none of these customers show a positive and significant upward trend in their purchase behavior on IBLP items. In the following sections, we summarize the result of three hypotheses by using basic statistics, statistical test and model estimation results.

TABLE IV. MODEL RESULTS FOR WEEKLY SPENDING ON IBLP ITEMS

Variables	Heavy customers	Moderate customers	Light customers
γ_0	1.883***	1.752***	1.711***

100-point items	0.471***	0.625***	0.547***
50-point items	0.446***	omitted	0.486***
40-point items	0.372***	0.438***	omitted
35-point items	0.282***	omitted	omitted
30-point items	0.532***	0.545***	0.576***
25-point items	0.670***	0.780***	Omitted
20-point items	0.482***	0.473***	0.522***
15-point items	0.315***	0.443***	0.537***
10-point items	0.423***	0.404***	0.484***
5-point items	0.570***	0.591***	0.586***
Time Trend [$\log(t)$]	$-0.014^{n.s.}$	-0.072***	$-0.006^{n.s.}$

***p-value < 0.01
n.s. = not statistically significant

A. Result for H1

1) H1a

In this research, we use basic statistics, variance analysis and Z-test to examine H1a. As the results of basic statistics for different types of customers' purchase behavior, the average customers' spending on IBLP items in three months is Heavy: 330, Moderate: 278, Light: 250 (Yen, February ~ April, 2016). This indicates that heavy customers spend more money on IBLP items than other customers.

Next, The result of variance analysis and Z-test among heavy, moderate and light customers' purchase behavior (IBLP items' purchase incidence and total spending on IBLP items) show that are significant (P-value < 0.05). These two results indicate that there is significant difference among three different types of customers' purchase incidence and their weekly spending on IBLP items. Based on these results, H1a is fully supported.

2) H1b

We use the Tobit II model to examine this sub-hypothesis. Based on the Table III, The parameters α_0 means the baseline IBLP items' purchase probability in the entire data period. The coefficients of α_0 for heavy, moderate and light customers are all significant, which are -0.693, -0.912 and -1.142. These coefficients indicate that initially, heavy customers are more likely to purchase IBLP items than other customers.

Table IV presents the model estimation results for heavy, moderate and light customers' weekly spending on IBLP items. Similar to α_0 from table III, the parameters γ_0 means the baseline weekly spending on IBLP items. The coefficients for heavy, moderate and light customers' weekly spending are also all significant, which are 1.883, 1.752 and 1.711. These coefficients represent that heavy customers spend more money on IBLP items initially than other customers. Based on the result from table 3 and 4, H1b is partly supported. Instead of moderate customers, heavy customers' purchase behavior are most affected by Oasis's IBLP initially.

B. Result for H2

1) H2a

For H2a, we conduct a variance analysis among 20, 10 and 5-point at first. Then, a Z-test is conducted to examine whether these differences are significant or not. In order to use Z-test to prove this sub-hypothesis, we can only use the variable that its sample size is large enough to satisfy the "large sample distribution theory". This theory suggests that the mean of a sample tends to approximate normality as the sample size grow [15] . Thus, in this research, we choose 3 different points (20, 10 and 5) to analyze, which their sample size are all greater than 100.

TABLE V. Z-TEST FOR CUSTOMERS' SPENDING ON 20, 10 AND 5-POINT ITEMS

Z-test (P-value)	20 and 10-point	10 and 5-point
Customers' average spending	2.69E-06 < 0.05 (Significance)	0.07 > 0.05 (Not significance)

As the result, the variance analysis among customers' total spending on 20, 10 and 5-point items shows that is significance (P-value: 0 < 0.05). However, such as Table V represents the Z-test for customers' spending on different point items in pairs, it is apparent that there are difference between customers' spending on 20 and 10-point items. On the other hand, their spending on 10 and 5-point items are the same. These two tables indicate that to some extent, customer do have different reactions to different points. H2a is partly supported.

2) H2b

The result of H2a suggests that at a certain level, different points do have different impact on customers' spending. Then, we use Tobit II model estimation result to examine H2b, which is "Higher-point items have more impact than lower-point items".

TABLE VI. MODEL ESTIMATION RESULTS FOR WEEKLY SPENDING ON IBLP ITEMS

Variables	Customers
γ_0	1.831***
100-point items	0.538***
50-point items	0.459***
40-point items	0.406***
35-point items	0.300***
30-point items	0.545***
25-point items	0.741***
20-point items	0.488***
15-point items	0.374***
10-point items	0.428***
5-point items	0.576***
Time Trend [$\log(t)$]	-0.032***

***p-value < 0.01
n.s. = not statistically significant

Table VI shows the model estimation results for all customers' weekly spending on IBLP items. The coefficients

of different points are all significant, in which 25-point items have the highest coefficient, 0.741. This result indicates that higher-point items do not necessarily have more impact on customers' purchase behavior that lower-point items. H2b is not supported. Based on the result of H2a and H2b, we can draw a conclusion that H2 is not fully supported.

V. Discussion And Conclusion

This research examines the short-term impact of different points in an item-based loyalty program on customers' purchase behavior over a four-month period. Based on the examine of an innovative loyalty program design, we extend Zhang and Breugelmans's [6] research by examining whether different extra points have different impact on customers. This research also conducts a Tobit II model to investigate the effects of different points in IBLP on customers' purchase incidence and weekly spending. Moreover, we divide customers into three groups and examine how different customers may have reacted differently to the IBLP.

As the result, we find that the impact of Oasis's IBLP does affect heavy, moderate and light customers' purchase behavior differently. The heavy customers are more likely to purchase IBLP items, and spend more money on these items than moderate and light customers initially. This finding is slightly different from empirical studies which suggest that moderate and light customers are more affected by the loyalty program than heavy customers, because heavy customers may not have the same motivation as others to increase their purchase behavior [2][3]. On the other hand, we also find that different points in Oasis's IBLP do affect customers' purchase behavior differently. The higher-point items does have more impact on customers' purchase behavior. However, a middle-level point, 25-point, has the highest impact on customers. This result suggests that it is not necessarily for higher-point items have higher impact on customers' purchase behavior.

The finding of this study can serve as a suggestion for firms that they should carefully consider which items go with which points, and then help managers to further improve the effect of IBLP by arranging more targeted items to different types of customers.

There are several limitations in this study that need to be further addressed in the future. Such as, this research only examines the short-term impact of Oasis's IBLP, and just focus on the impact of the IBLP, which means that we don't separate other programs' influences from it. Future research should study Oasis's IBLP under an experimental environment that allows researchers can control some factors, which may affect customers' purchase behavior.

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