

Consumers' Preference for Flat Rates: A Case of Media Access Fees

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Abstract: This paper examines the existence of users' preference for flat rate media access fees and identifies the factors that influence such preferences. Specifically, we explore consumer addiction to flat rate pricing plans, defined as "flat-rate preference," and examine such concepts from the perspective of behavioral economics. Consumers' psychological factors employed from behavioral economics are used for explaining the preference for flat rates and measured rates. The result from statistical tests based on the questionnaire survey suggests the existence of flat-rate preferences in both Internet access and mobile access services.

1. Introduction

This paper examines the existence of users' preference for flat rate media access fees and further identifies those factors that influence such preferences. Specifically, we explore consumer addiction to flat rate pricing plans, defined as "flat-rate preference," and examine such concepts from the perspective of behavioral economics.

A selective tariff system is often applied to media access services, within which a user can choose a fee structure that would result in the lowest bill payment for his/her usage. Consumers typically prefer flat rate versus measured rate pricing, because under such plans, a variety of communications services ranging from traditional telephony services to broadband internet access are bundled together into one flat rate package. Train (1994), has provided empirical evidence to support this view, showing that "consumers seem to value flat-rate service over measured service even when the bill that the consumer would receive under the two services would be the same". Conversely, traditional economics has emphasized the dominance of measured rates, as they are effective in outlining economic efficiencies. It has been interpreted that addiction to a flat rate is evidence of users' inclination to avoid the risks inherent in fluctuating monthly bills under measured rate plans.

When considering flat rate pricing however, user demand is not sensitive to price, therefore creating the potential for unnecessary usage from fulltime connections. At the same time, a higher flat rate price may exclude small scale users from subscribing to the service. From the perspective of media access providers, under such plans their supply would be increased but the revenue would not be proportional to network usage. It is apparent then that flat rate pricing does not attain resource allocation efficiency, which is considered "unreasonable" within the context of traditional economic theory. As a result, few analyses of flat rate pricing exist in the pricing literature. Mitomo (2001) has previously suggested that traditional economics could not be successfully applied to explain users' addiction to a flat rate, but instead that the integration of other academic perspectives would help in developing a more reasonable interpretation for consumer preferences for flat-rate pricing.

This research paper applies several important concepts invoked from behavioral economics to provide more reasonable interpretations of consumer preferences for flat-rate pricing plans. Behavioral economics, though difficult to apply empirically, provides deeper insights into consumer behavior since it includes psychological factors which allow for the consideration of irrational choice behaviors. Mitomo et al. (2007) tested empirically the existence of biased preference for flat rates for mobile phones and examine how psychological factors can affect the preference. They examined how fundamental concepts from Prospect Theory such as loss aversion, dependency upon reference points, and the shape of the probability weighting function could explain consumer inclinations towards flat-rate plans. Other fundamental concepts such as mental accounting, ambiguity aversion, cognitive dissonance, etc., are also applied to further explain such preferences.

Towards this end, we extend the analysis. In this paper, we first test the existence of consumer preferences for flat-rate pricing plans. Then, we investigate the factors that can be used to further understand and explain such preference. More concretely, The data used in this analysis were collected through web-based surveys, and include information on mobile phone and Internet access services. Both parametric and non-parametric methods were used in the statistical analyses.

The result shows that loss aversion and dependency upon reference points have significant influence on the existence of consumer preferences, although the shape of the probability weight function could not be identified. Mental accounting, ambiguity aversion and cognitive dissonance were also recognized as influential factors for such preferences.

This paper is organized as follows: Section 2 explains the behavioral economic concepts to be applied to explain the flat-rate preference. Sections 3 and 4 show the results of the empirical tests in which Internet access and post-paid mobile phone services are selected for the tests since they have been supplied under both flat and measured rates. Section 5 concludes the paper.

2. Background and Framework of the Research

According to traditional economic theories, only a measured rate (a single price) can work as a parameter and achieve economic efficiency through market mechanisms. Flat rates are not believed to attain higher economic efficiencies. Consumers' preference for flat-rate pricing has been regarded as a consequence of consumers' *risk averse behavior*.

However, we have realized from our experience that human behavior is not necessarily so rational as traditional economics assumes. The hypothesis on consumers' behavior that people maximize their utility represented with well-behaved utility functions would be too simplified. Our decisions or choices often violate the expected utility hypothesis. An interpretation based on risk avoidance is useful but not sufficient for explaining the preference for flat rates. Therefore, "rationality" of consumer behavior should be re-defined by incorporating psychological factors for describing more realistic processes in decision-making in order to reflect diversified human behavior.

Behavioral economics, which was initiated by Kahneman and Tversky (1979) and others, have integrated insights from psychological research into economic science, especially concerning human judgment and decision-making under uncertainty. Prospect theory, which is one of the important theories in behavioral economics, provides a framework for explaining how people prospect for and behave toward a risk, containing several important concepts such as *loss aversion*, *reference dependence* and *Overvaluation of a low probability* based on the shape of the value function and the probability weighting function.

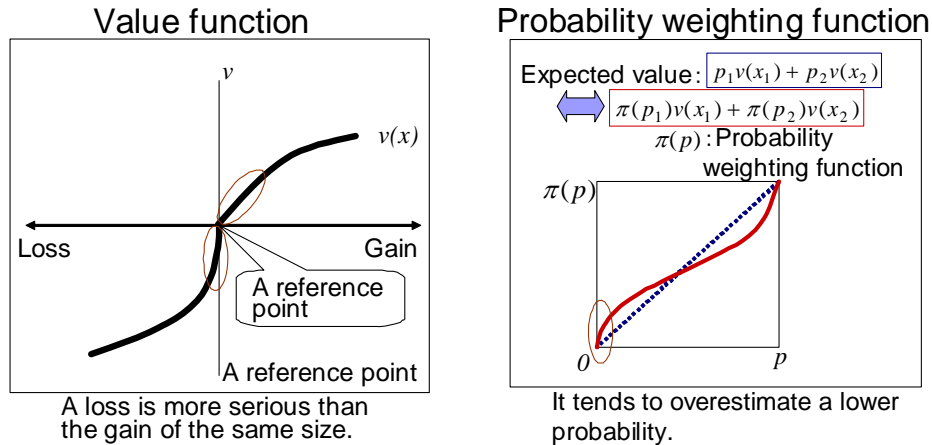


Figure 1: The Shape of a Value Function Figure 2: The Shape of the Probability Weighting Function

Figures 1 and 2 illustrate the two functions which characterize the prospect theory: the *value function* which replaces a utility function in the traditional economic theory; and the *probability weighting function* which represents a modified expected value weighted by the subjective evaluation of the probability that a phenomenon is likely to happen.

Loss aversion explains tendencies that losses are weighted substantially more than objectively commensurate gains in the evaluation of prospects and trades (Kahneman and Tversky, 1979). This can be represented in Figure 1 by a steeper curve of a value function in the loss direction than in the gain direction in the neighborhood of the reference point. Reference dependence represents a dependence of preference on one's reference point such as the current endowment, which is shown as the origin in Figure 1. The shape of the probability weighting function shows tendencies that low probabilities are over-weighted while high probabilities are under-weighted than the objective probabilities.

In addition to the the concepts from the prospect theory, we will employ other six behavioral economic concepts such as *mental accounting*, *ambiguity aversion*, *Habitual Choice*, *Misunderstanding of Payment Reduction*, *Misunderstanding of Payment Reduction* and *Dependency on the Level of Usage*. Thaler (1980) brought out the concept of mental accounting which is an idea that people set up mental accounts for outcomes that are psychologically separate, describing the rules that govern the integration of gain and loss. Ambiguity aversion describes preference for known risks over unknown risks (Camerer, Loewenstein and Rabin, 2004, Ch.1). In other words, measures of certainty affect decisions and people tend to avoid decision-making in uncertain situations. Other concepts have been discussed in articles of behavioral economics. These concepts can be applied to interpret the flat-rate preference or tendencies to avoid a measured rate in such a way as follows:

Loss aversion

If a monthly payment happens to be larger than the reference point (= the average monthly bill payment), users tend to overestimate the loss. To avoid the loss, they prefer flat rates.

Reference dependence

If the reference point represents a level of bill payment which a user is accustomed to, the level affects the subjective evaluation of the shift to a flat rate. Users' preference for flat rates is not affected by the absolute level of payment but by the diversion from the reference point.

Overvaluation of a low probability

With a typical probability weighting function, users with a low probability to overuse tend to overestimate the probability. They avoid an extraordinarily high amount of payment even if it doesn't seem to be likely happen, and then choose a flat rate.

Mental accounting

It represents how expenditures are recognized by consumers psychologically (Thaler, 1980). Under a measured rate, users are aware of bill payment every month. Under flat rates, users are not aware of such psychological burden.

Ambiguity aversion

It denotes behavior to avoid uncertainty. Under measured rates, the amount of bill is uncertain, while under flat rates the amount of payment is constant. Then, consumers prefer the latter than the former.

Choice by habit

This represents a kind of usage inertia. Users tend to use a billing plan which they are familiar with.

Misunderstanding of payment reduction

Users simply regard a new billing plan as one bringing about reduction of payment.

Dependency on the level of usage

Prospective usage levels affect the choice of a billing plan. That is, large-scale users tend to choose flat rates while small-scale users measured rates.

3. The Questionnaire Survey

In order to examine the existence of flat-rate preference and to interpret the flat-rate preference, a questionnaire survey was conducted to collect sample data. Due to the Japanese personal information protection law, random sampling using a postal mail questionnaire faces great difficulty. Instead, an online questionnaire survey was carried out over sample panels pre-registered in a survey research company. The data were collected in September 2006 and included 400 mobile users in their teens to over forties from each of which we collected 100 samples. They were selected randomly from the pre-registered consumer panels. The number of valid response was 313 and thus the response rate was 78.3%. The questionnaire included 44 questions with regard to the choice of fee plans in addition to questions asking personnel information. Some demographic data of the respondents and their current level of payment in Internet access and mobile are shown in Table 1 and Figure 3.

Mobile and Internet access are selected because they are representative of current communication media. These services are comparative in that Internet service has been supplied under flat rates while mobile under measured rates.

The summary of the questionnaire survey

Period: From September 1 to 6, 2006

Method: Online questionnaire survey

The number of valid response: 313 (The total number surveyed: 400)

Questions: 44 questions on the choice between flat and measured rates

Sex	Male	48.6%
	Female	51.4%
Age	Teens	23.6%
	Twenties	25.2%
	Thirties	25.6%
	forties and over	25.6%
Average monthly disposable money		¥35,424

Table 1: Basic Attributes of the Respondents

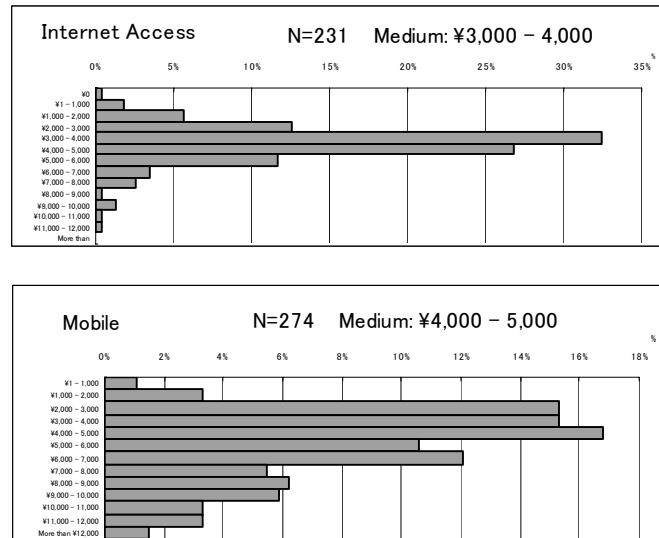


Figure 3: Current Levels of Payment in Internet Access and Mobile

4. Flat-Rate Preference

4.1 Existence of Flat-Rate Preference

A question was asked regarding the choice between a flat rate and a measured rate assuming that the both rates are available and that the bill payments in the both cases are eventually the same. The result shows that the differences between those selected flat rates and measured rates are 94 per cent points and 28 per cent points in the usage of the Internet and mobile phones, respectively (see Figure 4).

A chi-square test was applied to test the hypothesis that preferences on a flat rate and on a measured rates are the same (i.e., users distribute evenly between the two rates). The hypothesis was rejected at $p < 0.01$. The result indicates that flat-rate preference exists in the both media.

One may suspect that respondents who selected a fee system for one medium would select the same fee system for the other medium. Applying a MacNemar test which tests a difference between matched pairs of subjects with a dichotomous choice, the null hypothesis that no difference exists in the choice between the two media was rejected. This can also be shown by the cross table (Table 2). Many users selected different fee systems for the both media.

Note that the respondents are Internet users and are used to flat rates because they have been a prevailed fee system. This can cause a biased preference on flat rates.

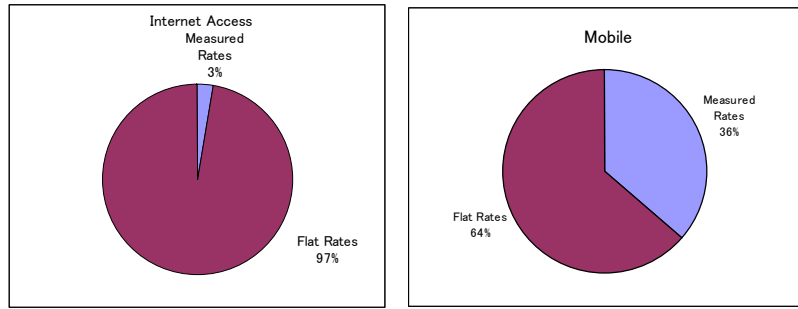


Figure 4: Choice between Flat Rates and Measured Rates

4.2 Differences between the fee System in Use and the One Each User is Willing to Use

By comparing the fee system currently chosen with one which they are willing to use, users' biased preference on a specific fee system can be found out. The result of a chi-square test examines whether the ratio of users' current use between flat rates and measured rates is significantly different from the ratio of their willingness to choose ($p < 0.01$).

In the same way as above, it should be examined if the respondents choose the same fee system as one actually selected, i.e., if the respondents' answers are influenced by the fee currently chosen. Without applying a McNemar test, a cross tabulation (Table 3) can reveal that there is a difference between the current choice and the willingness to use in the ratios of the choice between flat and measured rates.

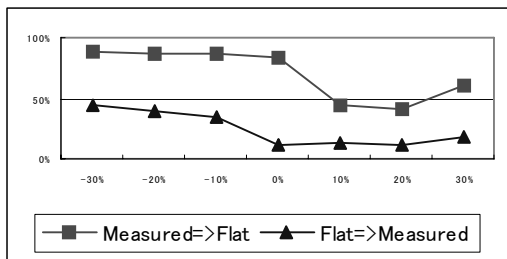
Internet Access				Mobile Access					
		Choice		Total			Choice		Total
		Measured	Flat				Measured	Flat	
Actual Usage	Measured	5	34	39	Actual Usage	Measured	104	152	256
	Flat	4	270	274		Flat	10	45	55
Total		9	304	313	Total		114	197	311

Table 3: Actual Usage of Tariff and the Choices Stated in the Answers (The Cross Tabulation)

4.3 Differences of Usage Inertia

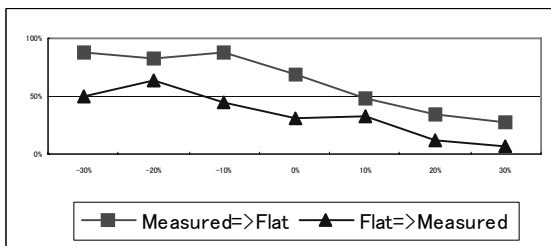
When a biased preference exists on one fee system, users should have stronger feeling of resistance to a shift to the other tariff than the reverse shift. Usage inertia, i.e., an inclination to stick to a choice, should be different between the two tariff systems. For the purpose, we examine what difference in price can trigger adoption of the other tariff. The respondents are divided randomly into seven groups, each of which are asked if they shift to the other tariff hypothetically faced with the difference in bill payment from -30% to +30% (7 levels).

Internet Access



Change in payment	Measured => Flat	# of samples	Flat => Measured	# of samples	Significance of the difference
-30%	88%	42	43%	46	*
-20%	87%	39	40%	43	*
-10%	87%	53	35%	46	*
0%	83%	41	11%	36	*
10%	45%	49	13%	47	*
20%	41%	44	12%	49	*
30%	60%	45	17%	46	*

Mobile



Change in payment	Measured => Flat	# of samples	Flat => Measured	# of samples	Significance of the difference
-30%	87%	55	50%	30	*
-20%	82%	45	64%	42	
-10%	87%	47	45%	58	*
0%	70%	46	31%	45	*
10%	48%	33	33%	45	
20%	34%	47	12%	49	*
30%	28%	40	7%	44	*

Note: An asterisk in the table rejects the hypothesis that the difference in the two averages is equal to zero (a chi-square test, $p < 0.05$)

Figure 5: Comparison of Trade-Off Points

The result is shown in Figure 5. The numbers of respondents in the respective levels varies from 30 to 58 due to random allocation of valid response.

In the both media, those who express the willingness to shift from a measured rate to a flat rate are more than those who is willing to shift from a flat rate to a measured rate. Many of the differences are significant as a result of chi-square test ($p < 0.05$) as shown in the tables with asterisk.

Note that the curves in the graphs should be downward sloping. However, it does not hold in some parts. In the sense, the result cannot retain overall consistency. This would result from the limited number of samples.

Then, let us consider the price difference which results in those willing to adopt the other tariff exceeding 50%. It happens for measured-rate users when the bill payment with flat rates is equal to that with measured rates in both Internet and mobile access (the left table in Table 4). On the other hand, it happens for flat-rate users only when the payment with measured rates is 20% lower in mobile access. It doesn't happen even when it is 30% lower in the case of Internet access (the right table in Table 4). The result strongly suggests the existence of flat-rate preference.

Change in Payment	Internet	Mobile	Significance of the difference
-30%	88%	87%	
-20%	87%	82%	
-10%	87%	87%	
0%	83%	70%	
10%	45%	48%	
20%	41%	34%	
30%	60%	28%	*

Measured Rates to Flat Rates

Change in Payment	Internet	Mobile	Significance of the difference
-30%	43%	50%	*
-20%	40%	64%	*
-10%	35%	45%	*
0%	11%	31%	
10%	13%	33%	
20%	12%	12%	
30%	17%	7%	

Flat Rates to Measured Rates

Note: An asterisk in the table rejects the hypothesis that the difference between the two averages is equal to zero (a chi-square test, $p < 0.05$)

Table 4: Comparison of Trade-Off Points between the Media

4.4 Preference Factors Contributing to the Choice between Flat Rates and Measured Rates

To identify the reasons why users choose either a flat rate or a measured rate, we picked up nine factors as shown in Table 5, which were collected from previous studies of behavioral economics. The statements to be examined are arranged based on these factors and modified according to the respective characteristics of measured rates and flat rates. We assume a hypothetical situation where each user should choose either a flat rate or a measured rate for Internet and mobile access under the condition that the bill payments in the both cases are eventually the same. Each respondent was asked to indicate his or her degree of agreement with the statement, according to a five-point Likert scale.

	Factor	Statement
M e a s u r e d	1 Choice by Habit	I will select a measured rate because I have used it.
	2 Ambiguity Aversion	because total usage is not predictable.
	3 Misunderstanding of Payment Reduction	because the total payment is expected to be lower.
	4 Level of Usage	because I will not use mobile/Internet so often
	5 Loss Aversion	because a flat rate may result in a higher payment
	6 Reference Dependence	because a measured rate will bring about a lower payment.
	7 Overvaluation of a low probability	because I can't ignore the possibility of low usage
	8 Mental Accounting	because I can know how much I have used.
	9	because I would not be responsible for the contract..
F l a t	1 Choice by Habit	I will select a flat rate because I have used it.
	2 Ambiguity Aversion	because total usage is not predictable.
	3 Misunderstanding of Payment Reduction	because the total payment is expected to be lower.
	4 Level of Usage	because I can use mobile/Internet without limit.
	5 Loss Aversion	because a measured rate may result in a higher payment
	6 Reference Dependence	because a flat rate will bring about a lower payment.
	7 Overvaluation of a low probability	because I can't ignore the possibility of excessive usage
	8 Mental Accounting	because I don't need to care how much I have used.
	9 Other External Factors	because I would not be responsible for the contract..

Note: Evaluation is based on a five-point Likert scale such as: 5: Strongly agree, 4: Agree, 3: Neither agree or disagree, 2: Disagree, 1: Strongly disagree.

Table 5: The Factors of Preferences

Based on the result, we can identify relative strength of each factor on the choice between measured rates and flat rates. The Wilcoxon signed-rank test is applied to test the equality of the means of two normal populations between the two related measurements. The result is given in Table 6.

Internet Access					Mobile						
	Preference Factor	Measured Rates		Flat Rates	Significance Level		Preference Factor	Measured Rates		Flat Rates	Significance Level
1	Choice by Habit	2.8	<	4.4	**	1	Choice by Habit	3.6	>	3.5	
2	Ambiguity Aversion	3.4	<	4.4	**	2	Ambiguity Aversion	4.1	<	4.2	
3	Misunderstanding of Payment Reduction	3.3	<	4.4	**	3	Misunderstanding of Payment Reduction	4.0	<	4.1	
4	Level of Usage	3.0	<	4.8	**	4	Level of Usage	4.4	<	4.5	
5	Loss Aversion	3.6	<	4.3	*	5	Loss Aversion	4.3	>	4.1	*
6	Reference Dependence	3.2	<	4.0	*	6	Reference Dependence	3.8	>	3.7	
7	Overvaluation of a Low Probability	3.3	<	4.5	**	7	Overvaluation of a Low Probability	4.0	<	4.2	*
8	Mental Accounting	3.3	<	4.6	**	8	Mental Accounting	3.4	<	4.3	**
9	Other External Factors	2.1	>	2.0		9	Other External Factors	1.6	<	2.0	**

Significance Level: *: 5%, **: 1%

Table 6: Comparison of Preference Factors Contributing to the Choice between Flat Rates and Measured Rates

As for Internet access, the all factors except “external factors” have a significantly greater influence on the choice of flat rates. On the other hand, “loss aversion” is the only significant factors having a greater impact on the choice of measured rates, and “mental accounting”, “overvaluation of a low probability” and “external factors” are significant factors working more on the choice of flat rates.

4.5 Relative Contribution of the Preference Factors

So far we have applied non-parametric methods. A parametric approach, however, can be utilized to estimate how each of the preference factors has a relative influence on the choice between measured and flat rates. A parametric approach has an advantage in that it can do with all factors influencing the choice within a single framework and identify their relative importance. In this section, we will employ a binomial logit model. We will show the result of mobile access only. As for Internet access, the estimation result was not statistically reliable because those who chose flat rates shared the majority (97%) and the number of measured-rate users was too small.

In the model, the explained variable is the choice between a flat rate and a measured rate, and the explanatory variables are the six factors of preference listed in Table 5, excluding those related with prospect theory for keeping independence of the explanatory variables. A maximum likelihood method was applied for the model estimation. The result is shown in Table 7. If a coefficient is positive, the preference factor contributes to the choice of flat rates. If negative, it does to the choice of measured rates.

Mobile			
The Number of Samples	313		
Initial Likelihood	-205.27		
Maximum Likelihood	-175.59		
Likelihood Ratio Index	0.14		
Preference Factors	Estimated Coefficients	Standard Error	Significance Level
Ambiguity Aversion	0.126	0.157	
Misunderstanding of Payment Reduction	-0.203	0.188	
Dependency on the Level of Usage	-0.032	0.196	
Choice by Habit	-0.289	0.113	*
Mental Accountitng	0.896	0.155	**
External Factors	0.356	0.123	**
Constant Term	-2.123	0.897	

**: $P \leq 0.01$, *: $P \leq 0.05$

Table 7: Relative Contributions of the Factors: The Case of Mobile Access

“Mental accounting” and “Other external factors” are significant as positive contributors. In the Japanese post-paid mobile communication market, measured rates have been applied generally and users should be care of the usage because it is hard to know how much they have spent every time they use a mobile phone. “Mental accounting” indicates the existence of such a psychological burden, which could promote the choice of flat rates. “Other external factors” implies a situation where parents give a mobile phone to their children or where business users are given mobile phones by their employer. We can imagine that these users would hate the fluctuation of payment.

On the other hand, “Choice by habit” is significant as a factor contributing to the choice of measured rates. “Choice by habit” may suggest that a kind of inertia exists in the choice of a bill plan and that, once a plan has been chosen, people are reluctant to chance to another even if it seems more reasonable. Note that these interpretations are not exact but just based on possible scenarios.

5. Conclusion

An application of flat rates has been considered to promote media access. In this paper, the statistical tests based on the questionnaire survey strongly suggest the existence of flat-rate preferences in both Internet access and mobile access services. Evaluations on flat rates are not the same and flat-rate preferences exist independently between the two media. Users’ willingness to use flat rates does not show significant correlations with currently adopted fees.

Consumers’ psychological factors employed from behavioral economics were used for explaining the preference for flat rates and measured rates. The non-parametric statistical tests have identified that all the factors except for “external factors” are contributing to the choice of flat rates in the case of Internet access. On the other hand, “mental accounting”, “overvaluation of a low probability” and “external factors” are influencing the choice in the case of mobile access.

The logit analysis can identify the relative strength of the factors contributing to the choice between measured rates and flat rates. Some factors in Table 5 have been excluded in the analysis because they have some correlation one another. The result suggests that “habitual choice”, which means that users have been currently accustomed to measured rates, has contributed to the choice of measured rates. “Mental accounting” is the significant factor for choosing flat rates.

Therefore, behavioral economic factors can successfully explain flat-rate preferences. Despite the persuasive argument of behavioral economics, its empirical analysis is often faced with a lot of difficulties in empirical tests. The result may be affected by the bias embedded in the data collected through the online survey, so that we should be careful to data collection. In order to describe the choice behavior between flat rates and measured rates, we need to employ experimental methods and interviews in addition to questionnaire surveys. Then, we can finally reach an overall evaluation of users’ choice behavior and flat-rate preference.

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