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A Study on the Perceived Value of Mobile Service Using the Contingent Valuation Method in Korea

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A Study on the Perceived Value of Mobile Service Using the Contingent Valuation Method in Korea

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Abstract

Mobile service fee in Korea has become a concerning issue. Although numerous studies have investigated this issue, there is still a lack of studies about the factors related to the dissatisfaction of the mobile service fee. This paper investigates those issues through estimating the gap between perceived value of mobile service and the actual payment. To measure this value and identify the factors affecting it, this paper uses the contingent valuation method with double-bounded dichotomous choice approach. The empirical result shows that usage time of mobile device, the priority of handset subsidy when choosing mobile service plan, and the awareness of mobile service payment system are related to dissatisfaction of mobile service fee. Moreover, the result implies that the mobile service subscribers might be satisfied to their mobile service fee in average. This paper suggested that the regulation for curtailing the retail price of mobile service evenly might not be an effective way to relieve the dissatisfaction of the mobile service fee.

1. Introduction

The advancement of communication technology makes the mobile service as an essential service in our life. The dependence on the mobile service sparks the increase of telecommunication service usage and expenditure, which was intensified after the introduction of the smartphone, and it has been a burden as increasing share of total expenditure. Ever since, reduction of the communication expenditure has been a controversial issue in Korea and the debates about this issue are focused on the mobile service fee. The abolition of membership fee for mobile service, the introduction of the Mobile Device Distribution Improvement Act, and the adoption of the Optional Contract Discount are efforts to lighten the burden on mobile service fee. Even though the government introduced a number of remedies, customers and non-government organizations consistently argue that the mobile service fee is still expensive. However, there is no absolute criteria that whether the degree of mobile service price in Korea is high or not. Peña-López (2015) compared the OECD countries' mobile price at PPP (Purchasing Power Parities) currency, and showed that the mobile price of Korea is relatively inexpensive. If the mobile service price in Korea is a reasonable level compared to other countries, the dissatisfaction of the mobile service fee can be caused by other factors such as subscribers' characteristics.

The purposes of this study are to investigate whether people perceive the mobile service fee is reasonable and to identify the factors involved. The main approach of this study is that people think that the fees are too expensive when their perceived value of their mobile service is lower than the actual payment. This study investigates the gap between the perceived value and the actual payment of mobile service, and analyzes the factors affecting it. To estimate the perceived value of mobile service in Korea, this study used a double-bounded dichotomous choice approach which is used to implement the contingent valuation method.

This paper is organized as follows. After reviewing previous studies related to the perceived value of mobile service in section 2, this paper presents the research methodology and data in section 3. Section 4 represents the empirical results, and the conclusion is given in section 5.

2. Literature review

2.1. Mobile service fee issues in Korea

Since the dissatisfaction of the mobile service fee has been a susceptible issue in Korea, there are several studies analyzing this issue. Firstly, there have been several attempt to compare the international mobile service price with Korea objectively to judge whether the mobile price in Korea is high or not. Lee (2012), for instance, proposed a Korea Mobile Telecommunications Index to compare with prices internationally. The author analyzed the amount of mobile service usage compared to PPP (Purchasing Power Parity) currency and concluded that mobile service price in Korea is not relatively high. This conclusion is consistent with a study by the Peña-López (2015) which also shows that the mobile service price in Korea is not relatively high compared with other OECD countries. There are also other studies which suggest that the regulation to reduce mobile service price might not be an adequate policy. Baek (2016) investigated the structure of household expenditure on telecommunication services and concluded that the price regulation of mobile service in Korea would not be effective in lowering household telecommunication expenditure. Kim et al (2017a) showed that improvement of acceptance and awareness of mobile policy plans reduce the expenditures through empirical analysis.

The studies above show empirical evidences that the degree of mobile service price in Korea is not the only factor for dissatisfaction. To shed light on other factors related, this study estimates the subscribers' perceived value of mobile service against their actual payment and identify which factors influence the customer perception.

2.2. The contingent valuation method for estimating the perceived value of mobile service

The contingent valuation method (CVM) is a methodology that designs a survey based on the hypothetical scenario about specific commodities and then directly derives the Willingness to Pay (WTP) or Willingness to Acceptance (WTA) of those commodities. The CVM is generally used to measure the value of commodities, when they do not have actual price such as public services. (L. Venkatachalam,

2004)

Because of this advantage to measure abstract value, there are several studies which measure the value of wireless service using the CVM. Jung et al (2008) calculated the WTP for mobile service, and Ko et al (2012) calculated the WTP for 500MB mobile data plan. Hence, the CVM is one of the most reasonable approach to estimate the perceived value of mobile service. Unlike the previous studies, this paper considers the respondents' actual payment because most mobile service provide a subscription. Considering it is important to estimate the perceived value of mobile service because the respondents' perception of mobile service value is proportional to the subscription fee. For instance, $40 mobile subscription fee provides more call and data compared to $30 subscription, so the customer who subscribes more expensive plans generally perceives more value from the service than those who subscribes cheaper ones. This paper uses the perceived value of mobile service to measure the degree of dissatisfaction through comparing it to the actual payment.

2.3. The factors related to the dissatisfaction of mobile service fee

This paper assumes that subscribers can perceive the dissatisfaction of mobile service fee because of two reasons. One reason is that subscribers who use more and various services within their given supplied services perceived more value compared to who don't and it affects to the subscriber's dissatisfaction. There are empirical results showing that subscribers are perceived the value from each service (e.g. mobile financial service) delivered through the mobile service. (Bock et al, 2015; KISDI, 2012) So, more and various use of mobile service would be related to the perceived value. In this context, the mobile device can be one of the factors affecting it. Tojip et al (2015) shows that the closed user-mobile device relationship drives the actual use of value-added mobile services. It means that the user-mobile device relationship can be a factor affecting the perceived value of mobile service. This paper uses the mobile device usage time to measure the degree of device-user relationship. In summary, subscribers who spend more time with their device tend to perceive more value than others who does not use as much even though they subscribe same mobile service plan. Thus, the first hypothesis is

proposed as below.

H1: Subscribers who spend more time with their mobile device may perceive more value against their actual payment than those who don't.

The other reason is that the subscriber chooses the mobile service plan inefficiently based on their actual usage perceives more dissatisfaction of their mobile service fee than others. Since the mobile service plan is moved to flat-rate, there have been some evidences that mobile subscribers often fail to choose the most suitable plan. (Gerpott and Meinert, 2017) These subscribers who choose unsuitable plan generally perceives lower value than others because they would not utilize given call and data which exceeds the usage. In Korea, the handset subsidy seems to be one of the most important factors for explaining the inefficient choice of mobile service plan. Generally, more expensive plan give more handset subsidy and this makes subscribers choose expensive one even though they actually do not use all the given call and data. Kim et al (2017b) mentioned that the handset subsidy used as a strategy for attracting subscribers to choose more expensive plan. Even though there has been an attempt to improve this situation through introducing the Mobile-Device-Distribution-Improvement law, it seems that the mobile handset subsidy is still impact on the subscribers' choice. For instance, the mobile handset subsidy is still proportionate to mobile service fee and it can induce to subscriber choose expensive plan. This paper attempts to measure this handset subsidy factor in two ways. First is that the priority when choosing mobile service plan. The subscriber who considers the handset subsidy mainly when choosing the mobile service plan may tend to choose mobile service plan inefficiently as described above. The other is that the awareness of mobile service payment system. The subscriber who does not recognize the details of payment also can tend to choose unsuitable mobile service plan. For instance, this type of subscribers can show a tendency to choose more expensive plan to reduce handset installment with less considering a total payment. In these assumptions, this study proposes two more hypotheses.

H2: Mobile service subscribers who prefer handset subsidy as a mobile service plan choice criteria perceive lower value against their actual payment than those who don't.

H3: Mobile service subscribers who understand mobile service payment system exactly perceive more

value against their actual payment than those who don't.

3. Methodology and Data

3.1. Double-bounded dichotomous choice model

This paper uses double-bounded dichotomous choice model Hanemaan (1991) suggested in his research for implementing the contingent valuation method. The dichotomous approach means giving a single bid that potentially reflect the maximum WTA[1] for a particular good. Then the respondents answer only 'yes' or 'no' about the bid on all or nothing basis. The advantage of the dichotomous choice approach is that it facilitates the respondents to complete the process. Furthermore, this approach can minimize the strategic bias in the WTA. The double-bounded dichotomous choice is a statistically efficient question form compared to the single-bounded dichotomous choice model because double-bounded model can reduce the number of observations by asking one-more follow-up question. (L. Venkatachalam, 2004; Hanemaan et al, 1991) The concept of double-bounded dichotomous choice as follows for estimating the WTA. Where the first bid price is t^1 and the second bid price is t^2 and then the WTA can be indicate as below following their answer.

Case 1) When the respondent rejects the first bid price and accepts the second one, $t^2 > t^1$ and the WTA is on between t^1 and t^2.

Case 2) When the respondent rejects both the first and second bid price, the WTA is higher than t^2.

Case 3) When the respondent accepts the first bid price and rejects the second one, $t^1 > t^2$ and the WTA is on between t^2 and t^1.

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[1] This paper uses the WTA, because the respondents' answers can be converged their actual payment when using the WTP.

Case 4) When the respondent accepts both the first and second bid price, the WTA is lower than t^2.

According to Lopez-Feldman (2012), the model for estimating the WTA can be derived as below. It can be modelled as the following linear function.

$$\mathrm{WTA}(z_i, u_i) = z_i'\beta + u_i$$

where z_i is a vector of explanatory variables, β is a vector of parameters, and u_i is an error term.

Next, let's define y_i^1 and y_i^2 as the dichotomous variables for the first and second response, then the probability that an respondent rejects the first bid price and accepts to the second can be expressed as $\Pr(y_i^1 = 1,\ y_i^2 = 0|z_i) = \Pr(\mathrm{n,s})$ and if it can be assumed that $u_i \sim \mathrm{N}(0, \sigma)$, the probability of this case ($y_i^1 = 1,\ y_i^2 = 0$) can be represented as below.

$$\begin{aligned}
\Pr(\mathrm{n,s}) &= \Pr(t^1 < WTA < t^2) \\
&= \Pr(t^1 < z_i'\beta + u_i < t^2) \\
&= \Pr\left(\frac{t^1 - z_i'\beta}{\sigma}\right) < \frac{u_i}{\sigma} < \Pr\left(\frac{t^2 - z_i'\beta}{\sigma}\right) \\
&= \phi\left(z_i'\frac{\beta}{\sigma} - \frac{t^1}{\sigma}\right) - \phi\left(z_i'\frac{\beta}{\sigma} - \frac{t^2}{\sigma}\right)
\end{aligned}$$

The other three cases also can be expressed as similar.

The β and σ can be obtained by using maximum likelihood estimation, and the function that needs to be maximized in order to find the parameters of the model is as below.

$$\begin{aligned}
\sum_{i=1}^{N}\Bigg[& d_i^{ns} \ln\left(\phi\left(z_i'\frac{\beta}{\sigma} - \frac{t^1}{\sigma}\right) - \phi\left(z_i'\frac{\beta}{\sigma} - \frac{t^2}{\sigma}\right)\right) + d_i^{nn} \ln\left(\phi\left(z_i'\frac{\beta}{\sigma} - \frac{t^2}{\sigma}\right)\right) \\
& + d_i^{sn} \ln\left(\phi\left(z_i'\frac{\beta}{\sigma} - \frac{t^2}{\sigma}\right) - \phi\left(z_i'\frac{\beta}{\sigma} - \frac{t^1}{\sigma}\right)\right) + d_i^{ss} \ln\left(1 - \phi\left(z_i'\frac{\beta}{\sigma} - \frac{t^2}{\sigma}\right)\right)\Bigg]
\end{aligned}$$

where d_i^{ns}, d_i^{ss}, d_i^{sn}, d_i^{nn} are indicator variables that take the value of one or zero depending on the each respondent's response. For example, when respondent say yes both the first and the second

question, $d_1^{ss} = 1$, and other indicator variables $d_1^{sn} = d_1^{ns} = d_1^{nn} = 0$. The WTA can be calculated by the β and σ.

3.2. Survey data

This paper designed survey questions based on the doubled-bounded dichotomous choice model. However, there is a different point about suggesting bid price to respondents. Generally, previous studies determine the range of bid price based on the preliminary survey, and suggests the bid price randomly within the range at the main survey because there is no standard for determining the starting point of bid price. However, the subscribers' actual mobile service payment can be a standard for determining of bid price in this paper. Furthermore, this paper assumes that the subscribers' perceived value of mobile service is proportional to their payment as mentioned in previous sections, so this approach can be a reasonable. Following reason, this paper suggests the bid price based on respondent's actual payment of mobile service, and the bid price is converted to a daily rate to estimate the WTA for forgiving one-day use of mobile service. The WTA can be overestimated in monthly basis because the mobile service is a kind of necessities in these days.

This paper set the starting point of bid price to two times of respondents' actual payment which converted to daily rate. If respondents accept the first bid price, the second bid price will be 50% lower than the first bid price. Otherwise the second bid price will be 50% higher than the first bid price. The details about the bid price is summarized at table 1. Because all respondents' bid price is based on their actual payment, all respondents bid price data can be converted to a ratio. For example, the first bid price is always represented to a 2 which means that two times of their actual payment, and the second bid price will be represented to a 1 if he accepts first bid price. Otherwise the second bid price will be represented to a 3. This converted data represents the gap between the respondents' perceived value and their actual payment.

The independent variables of this study are the usage time of mobile device, the priority of

handset subsidy when choosing mobile service plan, and the awareness of mobile service payment system. This paper also sets the age and the actual mobile service payment as control variables. The mobile service usage patterns and the perception of the mobile service can be varied by age, so this paper sets age as one of the control variables. The actual mobile service payment is also controlled because the bid price is suggested based on the actual payment. The questions for each variable are summarized at table 2, and the descriptive statistics of variables summarized at table 3. The survey data was collected in May 2015.

Table 1. The details of bid price in relation to actual payment

Actual payment of tariff (KRW)	The condition of suggestion	Bid price (KRW)
Around 30,000	First bid price	2,400
	When respondents accept first bid price	1,200
	When respondents reject first bid price	3,600
Around 40,000	First bid price	3,000
	When respondents accept first bid price	1,500
	When respondents reject first bid price	4,500
Around 50,000	First bid price	3,600
	When respondents accept first bid price	1,800
	When respondents reject first bid price	5,400
Around 60,000	First bid price	4,200
	When respondents accept first bid price	2,100
	When respondents reject first bid price	6,300
Around 70,000	First bid price	4,800
	When respondents accept first bid price	2,400
	When respondents reject first bid price	7,200
Around 80,000	First bid price	5,400
	When respondents accept first bid price	2,700
	When respondents reject first bid price	8,100
More than 90,000	First bid price	6,000
	When respondents accept first bid price	3,000
	When respondents reject first bid price	9,000

Table 2. The summary of question for variables

Variable	Question
Usage time of mobile device	How many hours do you use your mobile device in a day? 1) less than 30 minutes 2) between 30 minutes ~ 1 hour 3) between 1 ~ 2 hours 4) between 2 ~ 3 hours 5) more than 3 hours
Priority of handset subsidy	Which is the first and second priority when choosing mobile service plan? 1) The handset subsidy 2) The degree of mobile service fee 3) The amount of call and data of plan 4) The quality of service (e.g. data speed, coverage) 5) The additional service of plan (e.g. free Wi-Fi) 6) The brand image of mobile service provider
Awareness of mobile service payment system	Would you understand the mobile service payment system exactly? 1) Exactly understand 2) Partially understand or cannot separate handset installment and mobile service fee exactly
Actual mobile service payment	1) around 30,000 KRW plan 2) around 40,000 KRW plan 3) around 50,000 KRW plan 4) around 60,000 KRW plan 5) around 70,000 KRW plan 6) around 80,000 KRW plan 7) more than 90,000 KRW plan

Table 3. Descriptive statistics of variables used in the model

Variables	Mean	Std. Dev.
Usage time of mobile device	3.0227	1.398313
Priority of handset subsidy (input as a dummy variable)[2]	0.2983	0.4578
Awareness of mobile service payment system (input as a dummy variable)[3]	0.4344	0.4960
Age	39.1778	10.8098
Actual mobile service payment	2.3138	1.4861

[2] The respondents who answer that the first or second priority is handset subsidy are 1 and others are 0.

[3] The respondents who answer exactly understand are 1 and others are 0.

4. Results

The empirical analysis shows several interesting results. Table 4 and table 5 shows the results of the double-bounded dichotomous choice model. First, the empirical result shows that subscribers perceived 1.685 times more value against their actual mobile service payment in average and table 6 shows the percentage of respondents. This result implies two interesting points. First, the mobile service subscribers in Korea perceives that the value of mobile service is higher than their payment in average. Second, the respondent who rejects the first bid price tends to reject the second bid price and the respondent who accepts the first bid price also tends to accept the second bid price. It seems likely that subscribers' perception of mobile service fee can be divided into the dissatisfaction group and the satisfaction group.

Table 4. The result of estimation of maximum likelihood

		Coefficient	Z-statistics	p-value
Beta	Age	0.0241**	1.97	0.049
	Device usage time	0.2795***	2.84	0.005
	Handset subsidy	-0.5216**	-1.96	0.050
	Awareness of payment	0.6650***	2.68	0.007
	Actual payment	0.0113	0.13	0.895
	Constant	-0.2650	-0.38	0.704
Sigma		3.0656***	16.15	0.000
Observations			838	
Log likelihood			-1038.0907	

** p<0.05, *** p<0.01

Table 5. The estimation of the ratio of perceived value divided into actual payment

The ratio of perceived value against payment	Estimate (Mean)	Z-statistics	p-value
	1.6850	13.86	0.000
Confidence Interval (95%)		Lower	Upper
		1.4466	1.9233

Table 6. The percentage of respondents

	The percentage of accept	The percentage of reject
The first bid question	58.95%	41.05%
The second bid question (who accept the first bid)	**68.62%**	31.38%
The second bid question (who reject the first bid)	15.70%	**84.30%**

The empirical result also shows that the independent variables have statistically significant relationship to the perceived value of mobile service against their actual payment. First, the usage time of mobile device has a positive relationship to the perceived value against their actual payment and statistically significant at 1% level. This result can be explained that the subscribers' who spends more time with their mobile device perceived more value through experiencing various services. So, the usage time of mobile device seems to be one of the factors to ease the dissatisfaction of mobile service in Korea. The device subsidy priority has a negative relationship to the perceived value against their actual payment and statistically significant at 5% level, and the awareness of mobile service payment system has a positive relationship to the perceived value against their actual payment and statistically significant at 1% level. It means that the subscriber who has the device subsidy priority when they selecting the mobile service plan tends to dissatisfy with their mobile service fee and the customer who does not exactly recognize the mobile service payment system also tends to dissatisfy. This result is consistent with this paper's assumptions. Therefore, the handset subsidy and the awareness of mobile service payment system would be the factors that can explain subscribers' perception of their mobile service fee. The age has also a positive relationship with the perceived value of mobile service against their actual payment. It means that the younger person may perceive more dissatisfaction. Lastly, this paper finds that there is no statistically significant relationship between the actual payment of mobile service and the gap between the perceived value and actual payment. This may show the subscriber's perceived value is proportionate to their actual payment because this paper sets the bid price based on the respondent's actual payment. If the subscriber's perceived value is not proportionate to their actual payment, the variable can be statistically significant either way.

5. Conclusion

This paper attempts to estimate the gap between the subscribers' perceived value and the actual payment to measure the degree of dissatisfaction of the mobile service fee. To estimate the perceived value of mobile service, this paper uses the contingent valuation method with double-bounded dichotomous choice model. The empirical result showed that the mobile service subscribers satisfy with their mobile service fee in average. Furthermore, the result showed that the mobile device usage time, priority of mobile handset subsidy, and the awareness of mobile service payment system have a statistically significant relationship with the dissatisfaction of mobile service fee.

These results suggest some implications as below. First, a kind of regulations to reduce the mobile service fee evenly might be an ineffective approach, because average subscribers perceived more value than their actual payment and the perceptions of subscribers are not uniformly. Rather, focused on increasing the subscriber's perceived value (e.g., promote to use a various service with mobile device) can be an adequate approach for easing the dissatisfaction of the mobile service fee. Second, the separation of mobile service fee and device installment or subsidy also can be another effective approach for easing the dissatisfaction. The result implies that some subscribers felt dissatisfaction because of the priority of handset subsidy and indistinctness of mobile service payment system. If mobile service subscribers can exactly separate device installment and service payment, they will choose mobile service plan more wisely based on their usage or purpose and this will lead to ease the dissatisfaction for mobile service fee.

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