Value of Number Portability on Internet Phones

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Even though Internet phone service (IPS) continues to evolve in terms of quality and competitive pricing compared with the public switched telephone network (PSTN), the number of Internet phone subscribers is still low in South Korea. The Korean government decided to apply number portability to the IPS market in 2008. This study expresses its value in monetary terms with a contingent valuation approach. With this methodology, this study investigates the willingness of 316 current PSTN subscribers to pay for IPS, using a specific survey method called double-bounded dichotomous choices, to obtain more accurate data. The results show that the calculated value of Internet phone number portability positively impacts consumer welfare.

Keywords: Internet phone, contingent value, WTP, DBDC.

I. Introduction

Internet phone service (IPS) could benefit customers by reducing the cost of delivering competition in telephony and broadband. As the quality of Internet phones has continued to improve, they have become an increasingly attractive alternative to the public switched telephone network (PSTN). IPS was introduced in South Korea in 2000, and the prefix number for Internet phones, "070," has been used since 2005. The total number of Internet phone subscribers was 880,597, and the total annual revenue of this market was about $93 million as of the end of 2007. Compared with the PSTN market, which reached the limits of its growth with approximate annual revenue of $497 million and 23 million subscribers, the IPS market was still at an early stage of the market. However, considering the number of the asymmetric digital subscriber line (ADSL) users (householders) in South Korea is approximately 15 million, the diffusion of IPS in South Korea had been slow. As a result, in October 2008, the South Korean government applied number portability service to Internet phones in order to revitalize the Internet phone market. According to the Korean Telecommunications Act of 1996, number portability is defined as the ability of telecommunications users in the same location to retain their existing telecommunications numbers without compromising service quality, reliability, or convenience when switching from one telecommunications carrier to another [1], [2]. Number portability became popular with the advent of mobile telephones since, in most countries, different mobile operators provided different area codes. The provision of mobile number portability (MNP) is considered an essential factor in promoting competition within the telecommunications industry [2]. A few studies on number portability have concentrated on the benefits and effectiveness of MNP for the mobile telecommunications market, but no study of number portability for Internet phones has been conducted [3]. Because the characteristics and components of IPS differ from mobile service, basic research on the effect of Internet phone number portability (INP) on the Internet phone market has become necessary. Therefore, this letter expresses the value of INP in monetary terms to examine its effect on consumer welfare with a contingent valuation (CV) approach. This study applies a specific survey method called the double-bounded dichotomous choices (DBDC) to obtain accurate results concerning consumers' willingness to pay (WTP) for IPS [1], [4].

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II. Study Model

Economic value estimates for new goods and services have increasingly been used as tools to assess the impact of their introduction on both market prices and public welfare [4]. The CV method has been widely utilized to value the benefits of the telecommunications sector [1], [4], [5] and other public goods. For our survey composed of WTP questions, this study applied the closed-ended question format known as the DBDC CV method (DBDC-CVM) [5]. In the DBDC-CVM, the value that people assign to the proposed good is elicited by asking them if they would be willing to pay a given amount for its provision. The respondent only has to answer "yes" or "no." There are two kinds of DBDC-CVM: the single-bound and the double-bound methods. The double-bound method has been chosen for this study because it offers less biased estimates than the single-bound model [6].

The DBDC method, that is, the econometric model proposed by Camerson and James [7] and applied by Park and others in [1], is used to estimate the economic value of the INP supported by the Korea government to stimulate the Internet phone market [1]. Let the willingness to pay of respondent i be given by y_i^*, where i is the i-th respondent of the sample, which is dependent on respondent characteristics x_i' and y_i^*, and can be written as

$$y_i^* = x_i' B + \varepsilon_i, \qquad (1)$$

where x_i' is the vector representing the characteristics, B is the coefficient to be estimated, and ε_i is the mean zero error term. However, the WTP defined in (1) cannot be directly observed because the DBDC approach can yield only a "yes" or "no" answer to the question of whether or not the respondent would be willing to pay a given amount. Thus, we can define the indicator function as

$$\begin{aligned} I_{ji} &= 1 \quad \text{if} \quad y_i^* \geq t_{ji}, \\ I_{ji} &= 0 \quad \text{if} \quad y_i^* < t_{ji}, \end{aligned} \qquad (2)$$

where i=1, 2,⋯, N is the index of each respondent in the sample, j=1, 2 is the index of question sequence, and t_{2i} is the higher or lower bid. Respondent i can have one of the four responses:

$$(I_{1i}, I_{2i}) = (1,1),\ (1,0),\ (0,1),\ \text{or}\ (0,0). \qquad (3)$$

The log-likelihood function for the sample is written as

$$\begin{aligned} LogL = \sum_i \Bigg\{ & (I_{1i} I_{2i}) \left(1 - F\frac{t_{2i} - x_i' B}{\sigma}\right) \\ & + I_{1i}(1 - I_{2i}) \left(F\frac{t_{2i} - x_i' B}{\sigma} - F\frac{t_{1i} - x_i' B}{\sigma}\right) \\ & + (1 - I_{1i}) I_{2i} \left(F\frac{t_{2i} - x_i' B}{\sigma} - F\frac{t_{1i} - x_i' B}{\sigma}\right) \\ & + (1 - I_{1i})(1 - I_{2i}) \left(F\frac{t_{2i} - x_i' B}{\sigma} - F\frac{t_{1i} - x_i' B}{\sigma}\right) \Bigg\}. \end{aligned} \qquad (4)$$

The maximum likelihood estimation (MLE) of the model's parameters involves maximizing [4] with respect to parameters B and σ. The parameters are calculated as

$$E(Y) = \bar{x}' B. \qquad (5)$$

Table 1. Level of WTP.

Group	Lower bid	Original WTP	Higher bid
Group 1	50	100	200
Group 2	250	500	1,000
Group 3	1,500	3,000	6,000
Group 4	2,500	5,000	10,000

Unit: Korean won

Table 2. Result of chi-square test.

		Observed N	Expected N	Residual
Gender	Male	161	154.0	7.0
	Female	155	162.0	–7.0
	Total	316		
	Chi-square	0.629 (df=1)		
	Asymp. sig.	0.428		
Age	20-29	69	66.4	2.6
	30-39	88	72.7	15.3
	40-49	72	72.7	–0.7
	50-59	87	104.3	–17.3
	Total	316		
	Chi-square	6.202 (df=3)		
	Asymp. sig.	0.102		
Residence location	Seoul	88	83.1	4.9
	Incheon	37	54.1	–17.1
	Daejeon	22	20.7	1.3
	Daegu	12	18.1	–6.1
	Busan	21	25.0	–4.0
	Gwangju	11	9.3	1.7
	Woolsan	20	8.7	11.3
	Gyeonggi-do	13	6.4	6.6
	Gyeongsang-do	12	9.7	2.3
	Jeolla-do	5	3.2	1.8
	Chungcheong-do	32	33.8	–1.8
	Gangwon-do	19	20.1	–1.1
	Jeju-do	24	23.8	0.2
	Total	316		
	Chi-square	32.075 (df=12)		
	Asymp. sig.	0.001		

df: degree of freedom

III. Survey

The survey assessed those who subscribed to PSTN service during January and February 2008 in South Korea. Face-to-face interviews were conducted to offer the largest scope of detailed questions and answers. The respondents were divided into four groups to apply the DBDC survey method. Table 1 shows the level of WTP for the four groups. To check how representative our sample was in terms of gender, age, and residence location, a chi-square (χ^2) test was conducted. Table 2 shows the chi-square test results. There is no statistical difference between our sample and the population.

IV. Analysis and Results

The parameters of the model suggested in (4) were estimated with the data obtained from 316 respondents. The MLE technique was used to calculate WTP. From a statistical point of view, the MLE method is considered the most robust of the parameter estimation techniques [1] and has many large sample properties that make it attractive. Given the symmetric shape of the WTP distribution generated by (4), the mean rather than the median value can be indicated as an appropriate measure of central tendency. As previously mentioned, the mean WTP from the dichotomous choice WTP questions was calculated using (4). The mean of monthly WTP for number portability was 1656 won (approximately $1.50), as shown in Table 3.

Since there are approximately 880,000 users in South Korea's Internet phone market, the total mean demand for number portability is calculated as 880,000 × $1.50=$1,320,000 per month. Moreover, if all the 23 million PSTN subscribers transit to IPS, the expected monetary value of the WTP for number portability is $34,574,670 per month. INP service will be provided free of charge to the user, so the consumer welfare of INP could therefore produce as much as $35 million per month. The consumer welfare is one part of the social effect of product welfare. This letter only focuses on consumer welfare resulting from INP [8].

Table 3. WTP for number portability.

Mean (Korean won)		1656.435
t-statistic (p-value)		5.023584 (0.000)*
Confidence interval (95%)	Lower	223.7577
	Upper	0.00000
Chi-square (p-value)		24.746134 (0.000)*

*significant at 0.001 level

V. Conclusion

The monetary value of INP based on CV has been demonstrated in this letter. The results of our survey show that the calculated value of INP positively impacts consumer welfare. Actually, following the introduction of INP service in South Korea, the number of IPS subscriber doubled from less than one million to two million in two months, and the number of current Internet phone users is more than four million. Moreover, people are using mobile phones for their primary service and are using household phones for their secondary service. Thus, a low phone charge rate is the main focus when they choose a secondary phone service. Therefore, it can be guessed that the crossover or switchover between PSTN and IPS will continue.

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