

Valuation of Consumers' Personal Information*

– A South Korean Example –

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Abstract

Following the advent of the information age, it has become common for consumers to release personal information during the process of consumption, a practice which results in an increase in breaches or abuse of such information. The purpose of this study was to identify the appropriate monetary value of personal information from a consumer's perspective. Respondents were Korean nationals above the age of 16 who live in Seoul and the greater metropolitan region. Using the contingent valuation method (CVM), the authors elicited the amount of money respondents were willing to accept as being equivalent to the value of their personal information, with the resulting mean and median being US\$1,500 and US\$500, respectively. Via a nested probit model analysis, the existence of a relative minority which placed a significantly lower value on their personal information was found. For further research on this topic, specific tools allowing the execution of a more accurate analysis and various methods to measure personal information need to be adopted and utilized.

KEYWORDS: personal information; consumers' valuation; contingent valuation method (CVM).

Valuation of Consumers' Personal Information – A South Korean Example

The advent of the information age followed

the digital revolution, a period in which consumers who had been used to taking goods and service passively become providers (i.e. sellers). However, the tables have turned and consumers are now giving out personal information during the process of obtaining goods or services, although they are often reluctant to do so. This practice will result in an increase in breaches or abuse of personal information and it has yet to be determined whether corresponding compensation is being appropriately meted out in such cases.

Moreover, no case has yet to make it clear what the objective and concrete standard or basis for estimating the amount of compensation should be. Neither, it should be pointed out, have any case studies attempted to consider the issue from the standpoint of consumers, the true victims when personal information is lost by service providers.

The number of lawsuits claiming compensation for the loss of personal information is increasing internationally. In South Korea, significant cases on the loss of personal information have appeared since 2005, with approximately 10 cases and 50 judicial precedents witnessed in the country's different levels of courts. When taking a deeper look into the outcomes of these

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cases, it seems that there is a tacit level of compensation affirmed by some courts of law: In Japan, for example, it has conventionally been 500 yen, but more recently has risen to 10,000 yen (Matatabi Report, 2006). In South Korea's case, compensation levels have generally reflected those in Japan, ranging from US\$100 to US\$150 except for one case in 2007 when a jury ruled more generously in favor of the plaintiff, in this case, the consumer. Compensation was ruled to be US\$250, an amount much higher than normal (Anonymous, 2004; Koh, 2008).

It must also be mentioned that until now, little research has focused on placing a value on a consumer's personal information. That is, no studies have been done to determine a proper level of compensation for a personal information breach through an actual measurement of such data from the point of view of a consumer.

In light of Korea having one of the world's highest levels of broadband density with 73.4 percent of the country's population considered regular Internet users (Statistics Korea, 2008), the issue of personal information breaches in South Korea is certainly relevant. Consequently, since the late 1990s, the country's government and legal authorities have increased their collective efforts to update and in some cases rewrite legal regulations and policies on privacy issues particularly those related with electronic commerce. These efforts have also been pushed to the front burner due to the occurrence of several well-known cases domestically related to breaches of personal information at banks or on Web sites, resulting in an uproar by the general

public that their personal information was not being safely protected by service providers as the providers very own policies stated they would be. In Korea's case, it should be mentioned however, the public backlash was often short-lived due to drawn out litigation in such cases, particularly in those where no monetary loss occurred.

According to Kim (2008) and Kim, Seo and Cheon (2003), concerns related to privacy among Koreans were found to be somewhat higher (measured on a 5-point Likert scale) despite the existence of a relatively small number of tactics at their disposal to protect their own privacy considering the country's high level of IT and e-commerce integration. For example, it is not common practice for Koreans to make or utilize false identification (e.g. false name, secondary e-mail address), use privacy control techniques/tools, or delete cookies, et cetera. That is, Koreans appear to be aware of privacy issues on a theoretical basis, but do not yet seem to realize the seriousness of losing their personal information and the consequences of doing so. Studies have shown, in fact, that almost 70 percent of Koreans in 2001 (Kim, Jung, Lee, & Oh, 2001) and 50 percent in 2007 (Kim, Yoo, & Lee, 2007) had not experienced identity theft nor breaches of personal information, results to which the relative ignorance and/or lack of understanding of the real risks of such breaches after they occur may be attributed. The findings in the aforementioned studies may also explain the low interest in receiving compensation for the loss of personal information when there is no

subsequent tangible economic loss, and may reveal that Korean nationals do not consider the proper amount for corresponding compensation to be worthy of much concern. It may be proposed that save for cases of a personal nature, this nonchalant sentiment reaches far beyond Korea's borders. As such, if an acceptable "norm" in regard to the value of personal information is not determined, the level of compensation for loss of said information in future cases would merely be based on past practices or determined at the discretion of the business responsible for the breach. In this regard, the gap between actual compensation and the level expected by the wronged consumer would be presumably wide, thus making it difficult if not impossible for consumers to feel adequately compensated.

As was previously mentioned, the purpose of this study was to determine the appropriate monetary value of personal information from a consumer's perspective. In addition to this, other socio-economic variables known to be relevant to the valuation of personal information were examined. Specifically, this study is expected to contribute in 3 ways: First, in the field of consumer studies, this research may represent an initial experimental approach to measuring the monetary value of personal information from the consumer's viewpoint. Methodologically, this study differs from those previously undertaken in that it utilizes both double-bounded dichotomous choice as well as direct questions, which have made the results more reliable. In addition, by applying the nested probit model, the results could be said to provide more thorough insight.

Lastly, in relation to the aspect of becoming a judicial precedent, this study may supply input toward the establishment of a new standard or criteria for deciding upon the amount of compensation for a loss of personal information, which will eventually contribute to improvements in consumer welfare.

Literature Reviews

In this part, we examined the contingent valuation method widely used in environmental studies and public policy to measure the value of non-market goods or services. Then, previously conducted surveys measuring the value of personal information and studies adopting the concept of WTP (or WTA) as a relevant variable to privacy issues were reviewed.

Measuring Non-market Goods: Contingent Valuation Method (CVM)

The contingent valuation method (CVM) is well-known as an instrument for eliciting market valuation of a non-market good. It was originally proposed by Ciriacy-Wantrup in 1947 and Davis (1963) was the first to use this method empirically (Ninan, 2009).

While CVM appears to be biased even under the most ideal circumstances, critics generally concur that at least some of the bias-related issues appear to be manageable by using carefully designed survey instructions (Holmes, 1987). Furthermore, using a hypothetical market scenario is one of the more efficient ways to help respondents' understanding. Most of all, even though there exist some biases, CVM is the only known

valuation approach available for estimating some types of benefits, for example existence values or non-market goods and services (Ninan, 2009; Whittington, 2004).

Typically, such a survey asks how much money an individual would be willing to pay (WTP) or willing to accept (WTA) to maintain the existence of (or be compensated for the loss of) a good.

Willingness to pay (WTP) versus willingness to accept (WTA)

Researchers have long argued the existence of a large disparity between WTA and WTP measures of value. According to results from previous studies, people require far more compensation to give up a good that they are willing to pay to acquire it (e.g. Sinclair, 1976; Gordon & Knetsch, 1979; Bishop & Heberlein, 1986; Cummings, Brookshire, & Schulze, 1986; Gregory, 1986). In other words, individuals show a general tendency to overestimate WTA in the hope of getting higher compensation. Particularly when a gain is compared to a loss relative to some 'reference point', which is usually taken to be the prevailing pattern of property rights, usually seen as the status quo, WTA for a loss is significantly greater than WTP, which then varies due to the occurrence of the 'endowment effect' (Pearce, 2002).

In contrast, other studies have concluded that the initial discrepancy between WTA and WTP is an anomaly, which can properly be eliminated by the forces of learning and incentives which are present in a market (e.g. Knetsch & Sinden,

1984; Brookshire & Coursey, 1987; Coursey, Hovis, & Schulze, 1987).

In the case that the good is the one and only, then it is more likely that the difference between WTA and WTP is larger. Hanemann (1991) has shown that when income effects are held constant, a greater disparity between WTP and WTA is implied by the availability of fewer substitutes for the good.

Thus, if there are private goods which can be easily substituted for another good, then there ought to be little difference between an individual's WTP and WTA. According to Bishop and Heberlein (1979), both measures are biased but in the opposite directions.

It also has been said that the choice between WTP and WTA is basically a question of property rights: If respondents have property rights over the good, which means the individual has the right to sell the good, then WTA is the most appropriate format to use. In contrast, if the individual had to buy the good to enjoy it, WTP would be the correct measure (Ninan, 2009; Pearce, 2002; Mitchell & Carson, 1989). This issue was addressed in Pearce (2002) and is summarized as follows: Where individuals have a reasonable 'right' to something that might be taken away from them, the willingness to accept value should be used. In contrast, when individuals have only a reasonable 'right' to the status quo and an improvement is proposed, then the willingness to pay is the correct value to employ.

To summarize, WTP and WTA initially assumed that they, the two value measures, would not vary considerably, although this assumption

has been challenged by a series of studies in which disparities much greater than expected were found. In attempts to identify the reason, researchers have observed that both measures have biases, some of which might contribute to the unexpected discrepancy. In addition, considering the fact that personal information has different characteristics from public goods, a point which has been a core interest in CVM studies, WTA is thought to be the more effective method. In this light, the concept of WTA was chosen over WTP for use in this study.

Double-bounded dichotomous choice question

There are several ways of inquiring to induce an individual's WTA or WTP: By direct question, dichotomous choice question, bidding game or payment card, just to name a few. Among these methods, dichotomous choice questions have been thought to be more useful because several varieties of bias may be eliminated when this style is utilized. However, this method can be statistically inefficient in that vastly larger numbers of observations are required to identify the underlying distribution of resource values with any given degree of accuracy (Cameron & Quiggin, 1994).

The double-bounded approach was first proposed by Hanemann (1985) and Carson (1985). A double-bounded dichotomous choice question is, simply speaking, an iteration of a single-bounded dichotomous choice question – that is, a combination of two single-bounded dichotomous choice questions. The double-bounded procedure has shown to be statistically more efficient

than estimations employing the standard single-bounded model (Hanemann & Kanninen, 1991; Hanemann, Loomis, & Kanninen, 1991; Kanninen, 1993).

Double-bounded dichotomous choice questions are processed as follows: At the first stage, a specific amount of money as has been designated for the study is proposed (called 'a bid offer'), and respondents are questioned as to whether they have a willingness to accept or a willingness to pay for the good at this price. Corresponding to respondents' answers, the second question offers a different amount of money, which could be either higher or lower. Thus, there are four possible outcomes: (a) both answers are "yes"; (b) both answers are "no"; (c) a "yes" followed by a "no"; and (d) a "no" followed by a "yes."

This method helps to overcome the limits of direct questions and single-bounded dichotomous choice questions. Firstly, respondents find the method easier to answer, and there is less chance of overstating or understating the values. Secondly, even when the price offered at the first stage turns out to be determined incorrectly, it could be corrected through the second stage. For this reason, double-bounded dichotomous choice questions were determined to be appropriate for use in this survey.

Studies on Willingness to Pay/Provide (WTP) in Privacy Issues

To date, there have been only two studies done on valuing personal information in South Korea (Kim et al., 2007; Kim et al., 2001), although the results of these studies differ greatly

from reality for the following reasons: First, the measurement in both studies were based on the concept of willingness to pay for future risk, which was not the actual value of personal information and WTP for future risk was naturally much lower than the actual value. Secondly, Kim et al. (2001) offered 5 choices as answers ranging from 'US\$10~US\$50' to 'US\$150~US\$200' to represent the amount of money. However, it seems that these random choices were less than ideal representatives of a consumer's real valuation of personal information. In addition to that, by fixing the lowest and the highest amount, the true compensation range in respondents' mind could not be revealed. The result from Kim et al. (2001) showed that more than 70 percent of respondents selected the highest amount among the 5 choices, and it is not hard to assume that the majority of respondents had the higher amount in mind than the high-end choice. Third, Kim et al. (2007) suggested a hypothetical scenario, although one which hypothesized too extreme a situation (the breaches of personal information) to be managed at an individual level. It was thus described that the aftereffect was so large that it had to be dealt with on a national scale.

Both studies also examined socio-economic variables (e.g. gender, age, educational background, occupations, income and place of residence, etc.) in their analyses. Income (Kim et al., 2001; Kim et al., 2007), gender and occupation (Kim et al., 2001) were found to be significantly related to the level of WTP. In regard to income, respondents having higher incomes had a tendency to value personal information higher or

worth more in both studies. However, the effects of gender and occupation showed no consistency: Among subcategories of occupation, only those described as "self-employed" were found to be significantly related through several analyses, while gender was discovered as a significant variable (the WTP of females appeared lower than that of male respondents), albeit just once.

There have been several studies which utilized the concept of WTP in privacy issues as relevant variables. Particularly in earlier studies on privacy concerns, consumers' willingness to provide their personal information in exchange for some kind of benefits (e.g. various information, financial benefits, better services, convenience or speed, et cetera) appeared as one variable. Phelps, Nowak and Ferrell (2000) stated that consumers' willingness to provide personal information changed according to the types of personal information (e. g. lifestyle, shopping information, financial information, socio-economic information, etc.) In Phelps, Souza and Nowak (2001), "willingness to surrender," similar to "consumers' willingness to provide personal information," was used with the types of personal information and desire for control over personal information.

Methodology

The survey in this study was carried out as follows.

Data Collection and Sample

An online survey was conducted during a period of one week in mid-September 2007.

Respondents were individuals older than 16 years old who live in Seoul, South Korea and throughout the greater Seoul metropolitan area. For the convenience of analysis, the quota sampling which was used with regard to gender and the distribution of respondents by age group was as follows: From 16 to 29, 34 percent; 30s, 22 percent; 40s, 22 percent and over 50, 22 percent. The data used in the final analysis consisted of 985 samples, excluding inconsistently and insufficiently completed samples.

To collect data, a structured questionnaire was developed. Following the guidelines of designing a proper CVM questionnaire set out by Carson, Flores and Meade (2001) and Arrow, Solow, Leamer, Portney, Radner and Schuman (1993), general questions about the attitudes of the respondents towards privacy – concern of giving out personal information, perceived risk of environment when providing personal information, demand for control over consumers' own personal information, trust in the company which asks to provide personal information, and satisfaction with the previous experiences when providing personal information – and their behaviors/habits protecting and proposing personal information were included, as well.

Measurement

The standard procedure established by CVM researchers is to use a two-step experimental structure where a pretest is performed to obtain preliminary results (Kanninen, 1993). In this study, preliminary focus groups (FGs) were executed 3 times, while 1 pretest was carried out.

The main survey was structured on the preliminary FGs and the pretest.

Although personal interviews are generally used when conducting a survey which applies the contingent valuation method, in this case, an online survey was utilized. Because respondents were given details on "personal information" – explaining various sub-categories of it and situations used, such as opening a bank account at bank, making an e-mail address, et cetera – it was deemed that there was no pressing need for an interviewer. For quality control with respect to the respondents' comprehension of the questionnaire, several preliminary interviews and a pretest were performed before the main survey.

The survey was designed in a two-stage 'yes' or 'no' referendum format put to the respondent as a vote on a specific amount of money to compensate for the loss of their personal information. The respondents were asked to assume that they were participating in the valuation process, in other words, to assume that they themselves had experienced breaches or invasions of their personal information (see Figure 1).

The specific question asked was, "Are you willing to accept the amount of compensation presented in these cases (judicial precedents) for the loss of your personal information?" If a respondent accepted the first price, then a lower amount of money was proposed in the second stage. In contrast, if the initial amount was rejected, a higher price in the second stage was then offered.

In the double-bounded dichotomous choice questionnaire, actual judicial precedents were

presented instead of a hypothetical market scenario, to allow respondents to accept the new concept of personal information as a market good. After several preliminary interviews and the pretest, it was determined that the hypothesis which assumed that there was a market for trading personal information was too radical and artificial for the respondents to accept naturally and might include biases of its own.

For the selection of judicial precedents, two criteria were taken into account: (a) the judicial precedents had to be well-known so as to make it easier for the respondents to answer; and, (b) though the judicial precedents were in regard to cases of compensation for personal information, additional loss and damages (especially economic or monetary loss) were not occurred so as not to make the answer significantly higher than the actual value of personal information in the minds of respondents.

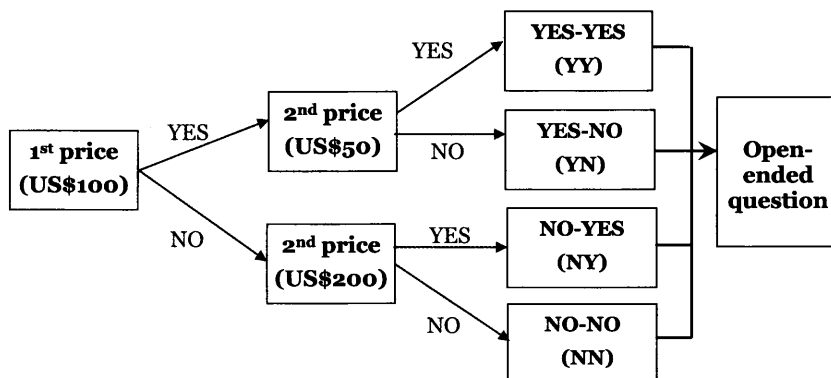
The double-bounded dichotomous choice question utilized in this survey was analyzed statistically using the nested probit model.¹⁾

At the end of the questionnaire, an open-ended question regarding valuing personal information was proposed. Respondents were asked to write down the proper value (amount of money) of personal information as they imagined it. The question was stated as follows: "How much compensation do you think proper for the loss your personal information?"

Open-ended questions are problematic in that they often remain unanswered for several reasons (Carson et al., 2001). However, this study ruled out such risk by using dichotomous choice questions along with open-ended questions.

Moreover, the researchers in this study were able to obtain data illustrating the extreme levels of valuation of personal information. When using bounded questions, respondents may hold a distribution of values - amounts they would be willing to pay (Cameron & Quiggin, 1994, p. 233) - but not the exact amount of money in their mind. Since this study was undertaken to find out a proper monetary value of personal

Figure 1. Process of CVM in this Study



NOTE. At current exchange rates, the dollar value given for the 1st price may be considered US \$150, while that for the 2nd price may be US \$70 and US \$270, respectively.

1) Since this is a part of another study (Kim, 2008), a probit model was used instead of a logit model, which is often used in CVM studies, for the sake of consistency in several related results.

information, using open-ended question at the final stage was suited to our objective.

Through various studies related to the contingent valuation method, several biases have been mentioned, i.e.: Starting point bias, interviewer and respondent bias, strategic bias, hypothetical bias, information bias, survey instrument bias, aggregation bias, embedding problem (scope effect), et cetera. Measures previously mentioned (e.g. double-bounded model with open-ended question, interviewer's absence but notice of clear definition of the goods and the situation in which it is consumed or used, judicial precedents instead of hypothetical market, pretest and preliminary interviews) were taken to minimize these biases.

Results

Results from the survey are summarized below.

Overall Level of Valuation of Personal Information

The general findings are as follows (see Table 1 for additional information):

First, the median and mode of the value of personal information were approximately US\$500 and US\$1,000, respectively, with the mean being approximately US\$1,500.

Secondly, very large variances were witnessed in both datasets. Therefore, it was determined that the data had to be dealt with in a more delicate way, and that a closer analysis of the tools would be necessary.

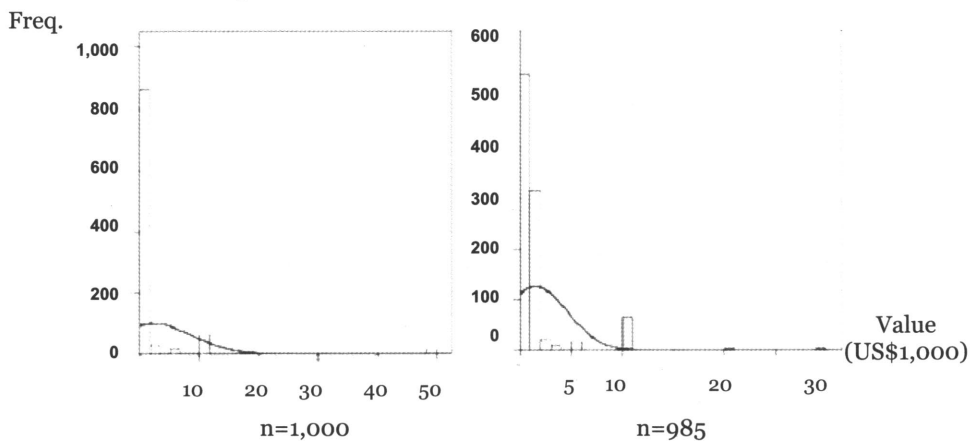
Thirdly, the histogram presented in Figure

Table 1. Overall Level of Valuation of Personal Information

No.	Mean	Mode	Median	Standard Deviation
1,000	US\$2,500 (₩2,217,300)	US\$1,000 (₩1,000,000)	US\$500 (₩500,000)	US\$7,000 (₩6,666,000)
985	US\$1,500 (₩1,489,600)	US\$1,000 (₩1,000,000)	US\$500 (₩500,000)	US\$ 3,300 (₩3,127,000)

NOTE. The amount of money (US\$) was recalculated reflecting the current exchange rate. It was originally measured in Korean won (₩).

Figure 2. Valuation of Consumers' Personal information



2 illustrated the distribution as being skewed to the right. The minimum was approximately US\$5 and the maximum was US\$50,000.

Nested Probit Analysis on a Double-bounded Dichotomous Choice Question²⁾

A double-bounded dichotomous choice question was analyzed applying the nested probit model, which is an efficient analytical tool in ordered or stepwise questions. Socio-economic groups, especially age groups, are reorganized to be more suitable to this analysis, and these renewed dummy variables were used in statistical data processing.

In a double-bounded dichotomous choice question, 314 respondents (approximately 32 percent) accepted the 1st price offered (US\$100) and 671 (68 percent) refused. Among the 314 who showed a willingness to accept at the first stage, 86 respondents (27 percent) said "yes" to the 2nd price, which was US\$50 and rest of them (73 percent) said "no." The 671 respondents who didn't say "yes" at the first stage were suggested US\$200 as compensation at the second stage. At this time, only 71 (11 percent) accepted this price and the remaining 600 respondents (89 percent) refused the amount of money (US\$200).

Table 2. Marginal Effects of Variables

	1 st price (1=disagree)			2 nd price (1=disagree)					
	US \$100			US \$50			US \$200		
	coff.(β)	Mean (X)	Xβ	coff.(β)	Mean (X)	Xβ	coff. (β)	Mean (X)	Xβ
Habit of providing ^a (1=low)	-.37***	.81	-.30	.18	.87	.16	.26	.78	.20
Behavior of protecting ^b (1=low)	.16	.91	.15	-.41	.91	-.37	.54*	.92	.50
Gender (1=female)	-.29***	.50	-.14	-.11	.58	-.06	-.24	.46	-.11
Age 1 (30s)	-.05	.22	-.01	.05	.21	.01	-.21	.23	-.05
Age 2 (40s)	-.22	.22	-.05	-.13	.24	-.03	.31	.21	.07
Age 3 (+50s)	-.19	.22	-.04	-.18	.24	-.04	.00	.22	.00
Education (1=under College)	.15	.54	.08	-.07	.53	-.04	.16	.55	.09
Income 1 (US \$1M-3M)	-.21	.35	-.07	.27	.37	.10	-.51**	.33	-.17
Income 2 (+ US \$3,000)	-.06	.36	-.02	.18	.37	.07	-.42*	.36	-.15
Constant	.89***	1.00	.89	-.39	1.00	-.39	-1.68***	1.00	-1.68
SUM		.48		-.60		-1.31			
R ² / Rescaled R ²	.03 / .04			.02 / .03			.03 / .07		

*p < .05; **p < .01; ***p < .001

Although a, b variables were not important in this study, they were presented in Table 2 to ensure the consistencies among results from a sequential analysis in another study (Kim, 2008).

2) For more details on this analysis, see Kim, (2008).

Marginal effects of variables in each stage

The probability of a 'yes' reply at each stage showed that income was not a significant variable in the first stage, but became so in the second stage question. The lower the level of income became, the higher the probability of a 'yes' response to the second price was found to be.

As for gender differences, results showed that males surveyed were more likely to agree to the first price at first glance. However, through a more careful analysis, it turned out that females had a higher tendency to agree to both prices [a "yes-yes" combination]. Females were thus assumed to be more vulnerable because they showed a tendency for unconditional agreement with any amount of money suggested at each stage.

Furthermore, consumers' habit of providing personal information was another significant variable in the first stage questionnaire, although behavior protecting their personal information was significant only in the second stage where

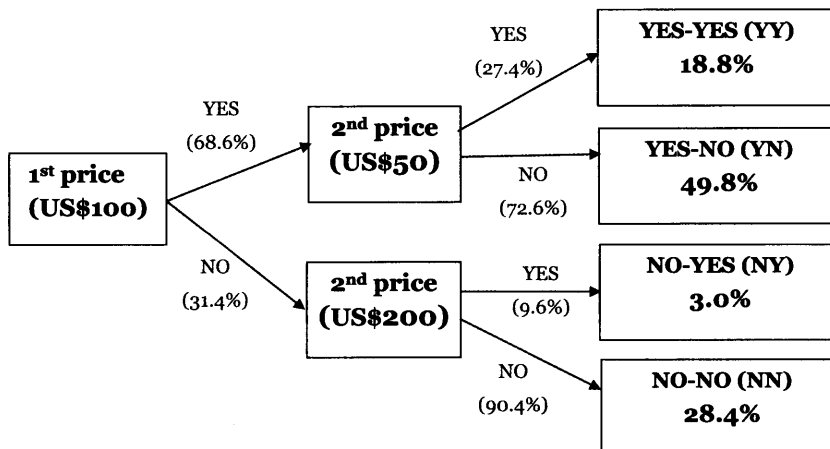
respondents were given a second chance to consider valuing their own personal information. See Table 2 for additional details.

Response probabilities in four possible outcomes

Through calculations with the marginal effects of variables resulted from the nested probit model analysis, the response probabilities expected in each stage were elicited (see Figure 3).

Even when the respondents answered 'yes' to the first price, they wrote a higher amount of money at the end of the questionnaire. As a matter of fact, only 3 percent of respondents wrote down a smaller amount of money than the price suggested at the first stage. The response probabilities also predicted that a "yes' at the first stage/'no' at the second stage" combination would be the most likely to result. Hence, it was observed that the majority of respondents had been thinking of a higher amount of money for compensation.

Figure 3. Response Probabilities



Conclusions

This study came to the following conclusions based on the research results found to date:

To begin, the current level of monetary compensation in case of breach or loss of personal information needs to be raised. It is rational that the monetary valuation of personal information from a consumer's point of view has to be considered as the most important standard when determining the amount of compensation when issues regarding loss of personal information arise. Based on the results of our survey, the median (US\$500) seems to represent the more appropriate amount as compensation considering the large variance from our data. At present, even though it is difficult to accept this amount of money as compensation in practice, this study verified that the current level of monetary compensation is far lower than what seems appropriate or fair in the mind of the consumer. Therefore, the level of compensation corresponding to the loss of personal information should be adjusted to a level higher than the current level to keep pace with the expectations of consumers.

Secondly, it is necessary to accept the diversity of sub-groups in socio-economic variables and to establish and implement policies designed for each specific sub-group. Simmons, Dolan and Braun (2007) asserted that "a one-policy-fits-all approach will penalize" groups ignored in society. In particular, greater concern for more vulnerable sub-groups in making decisions on consumer policy is requested. In valuing their own personal information, people showed significant differences by gender and income level, and this

reflects the fact that there are special subgroups which need to be educated. Policy makers should take greater interest in the minority subgroups valuing their own information at rates much lower than the average level.

Discussion and Implications

From the aforementioned conclusions, the following recommendations are suggested.

Considering the fact that the monetary valuation of personal information has a very large spectrum of variance, a more intricate and sophisticated method was needed for the analysis. For this reason, further study was conducted accordingly to examine causalities among variables, applying OLS in addition to a quantile regression analysis.³⁾

However, we must be careful at this point to avoid jumping to conclusions based on a single experiment. Our results may not be able to be generalized to other situations, that is, different samples, other regions in South Korea or other countries in the world, a new method employed to measure non-market goods, et cetera.

For further research on the valuation of personal information, it will be helpful to compare the results from various methods of measuring the value of personal information. From this, researchers can approach the actual value on a gradual basis. Moreover, much more research is needed to further develop and refine such measures. It is hoped that the results of this study will encourage the discovery of new and improved approaches.

Moreover, the consistent conducting of a

3) For more information, please refer to Kim (2008).

national survey concerning personal information issues will improve the environment and legislative system in the information market.

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