MEASURING THE NON-OBSERVED ECONOMY

A Survey-Based Study of Demand in the South Korean Prostitution Market

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Abstract

Illegal activities are by their nature difficult to measure, despite the potentially important role they play in the economy. Their inclusion in South Korea's GDP is necessary to reflect South Korea's national economy more precisely. In this paper, I use a variety of survey methods to provide an estimate of the incidence of prostitution. I estimate the demand for prostitution services in South Korea by conducting stratified random sampling surveys of 671 South Korean adult males. Because the survey topic was sensitive, I conducted both randomized response (RR) and direct response surveys and compared the results. The RR survey interview method allows respondents to respond to sensitive issues while maintaining confidentiality. According to the survey results, participants felt protected by the RR questionnaire design and provided more accurate answers. I estimate that about 60 percent of South Korean adult males seek the services of prostitutes at least once in their lifetimes and about 40 percent of South Korean adult males seek the services of prostitutes at least three times annually. I also found that demographic variables such as education and income levels, the number of sex partners, and marriage status determine the probability that a male would seek the services of a prostitute. The estimated total revenue of prostitution services in South Korea is approximately $18 billion, which equals about 1.66% of South Korea's GDP.

1. Introduction

Non-observed activities are activities that are missing from the basic data used to compile the national accounts because they are underground, illegal, informal, household production for individual final use, or due to deficiencies in the basic data collection system.[1] They are said to comprise the non-observed economy, and including them in the national accounts is necessary for the consistency of the overall system of national accounts and comparability of national accounts figures between countries and over time. However, for practical reasons and due to a severe lack of data, very few countries explicitly include estimates of illegal production in their national account figures. Although there have been rough ideas of how to measure illegal economic activities and a few attempts to measure them by estimating the total supply, there has been little effort to measure the size of the prostitution market by measuring the total demand in general. Prostitution is illegal in South Korea. Even after the government strengthened regulations against prostitution activities in 2004, the prostitution market has flourished. Although the Ministry of Gender Equality and Family in 2007 attempted to measure the number of prostitutes in South Korea, measuring the total supply of the prostitution market has its difficulties or problems because the prostitution service business is more diversified and hidden, making it hard to estimate the total number of prostitutes and suppliers. In this paper, I measure the size of the South Korean prostitution market by examining the total demand for the prostitution market. To estimate the total demand, I conducted stratified random sampling surveys of South Korean adult males.

To overcome subjects' fears that the instruments of the survey could be traced to them, which would lead to underreporting, I used an RR survey. Methodological research on the accuracy of reports in surveys about sensitive topics suggests that misreporting is a major source of error and bias in the estimates derived from these surveys.[2] To reduce or eliminate this problem, I used Warner's interviewing procedure or technique called the "randomized technique."[3] The respondent selects a question on a probability basis from two questions without revealing to the interviewer which of the alternative questions has been chosen. The individual replies, which must be "yes" or "no" to each question, is of no certain meaning for a specific respondent, but provides useful information for estimating the proportion of the population that has the "sensitive characteristic." Among many different models derived from the "randomized response" technique, I used the unrelated question randomized response model set up by Stanley L. Warner and Daniel G. Horvitz, which uses two questions—the sensitive question and an unrelated question—and uses a randomization device to determine the question that the respondent should answer. I used as a second question the probably unrelated statement "The second hand of your watch or clock around you is between 0 and 30," to which the respondent is supposed to reply simply "yes" or "no."

I used stratified random sampling to recruit survey participants. Any difficulties in sampling individuals at random can be greatly diminished by adopting groups as the elements of sampling, which is called a stratified random sampling. In such a method, I select not individuals but groups or districts. Districts or groups (e.g., geographical areas, age groups, genders) are

1   Measuring the Non-Observed Economy: A Handbook (Organization for Economic Co-operation and Development, 2002), 3.

2   Tourangeau, Roger, and Ting Yan, "Sensitive Questions in Surveys." Psychological Bulletin, 133(5): 1.

3   Warner SL. 1965. "Randomized response: A survey technique for eliminating evasive answer bias" Journal of American Statistical Association, 60(309): 63.

selected that together yield the same averages or proportions as the whole country or population with respect to those quantities or qualities that are already a matter of statistical knowledge, and a sample is randomly taken from each stratum. It is assumed that the districts or groups taken together will be typical of the whole. Using the concept of stratified sampling, I recruited for the survey; I set strata by the criteria: age and employment state. To represent the general South Korean adult male population, I asked approximately 1,000 public servants, 1,600 professional workers (lawyers, doctors, and professors), 900 college and graduate students, 800 major company employees, 1,500 employees from small- and medium-sized companies, 1,000 private business owners, 200 part-time workers, and 400 retired workers to participate in the survey by e-mail. I obtained these contacts through acquaintances and friends. In total, I asked more than 7,400 people to participate in this survey. The number of subjects was 471, and the estimated response rate was 6.3%. Additionally, in order to examine and analyze the difference between average buyers and frequent buyers, I conducted a survey on 52 users of online communities of sex buyers and conducted a paid survey on 200 panels (people who respond to the survey questions and get paid by the research company), using Open Survey, a smart phone application-based survey. After conducting surveys, I tested my hypotheses. I began by examining whether responses to the RR technique are similar to those from the DR technique. The result was that a higher proportion of people stated that they sought prostitution services in the RR questionnaire than the DR questionnaire, and thereby I concluded that a number of participants appeared to feel protected by the RR questionnaire design and provided more accurate answers. Next, I explored the determinants of demand for services of prostitutes and conjectured important relationships about prostitution service-seeking behavior and the regressors: income level, education level, number of sex partners, individual risk aversion, and presence or absence of religious belief. It is also estimated that Korean adult males who had no sex partners during the past three years were more likely to seek the services of prostitutes. Lastly, using the results of the survey, I examined the total demand for prostitution services. Based on responses to the direct response (DR) survey, I estimated the average amount of money a Korean adult male spends on prostitution services according to age. I then compared how much the DR survey responses were biased downward compared to RR survey responses. Using the 2010 South Korean male population data, I multiplied the number of South Korean males per age level by the adjusted average amount of money a South Korean adult male spends on prostitution services according to age. I estimated the total demand for prostitution services in South Korea to be 20.55 trillion won ($18 billion), which equals about 1.66% of South Korea's GDP.

2. Non-Observed Economy and Illegal Activities

First, it is necessary to define the concept of a non-observed economy and review the extant studies about such economies and their measurement. Non-observed activities are activities that are missing from the basic data used to compile the national accounts because they are underground, illegal, informal, household production for own final use, or due to deficiencies in the basic data collection system. They are said to comprise the non-observed economy (NOE), and including them in the national accounts is referred to as measurement of the NOE.[4] The 1993 SNA offered an internationally accepted conceptual framework for economic statistics. In aiming for exhaustive measurement of activities within the 1993 SNA production boundary,

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4   Measuring the Non-Observed Economy, 3.

the goal of the national statistical system was to reduce as far as possible the incidence of non-observed activities and to ensure that those remaining are appropriately measured and included in the GDP estimates.[5]

Three broad areas of activities comprise non-observed economies: underground, informal, and illegal. I will focus on illegal activities. The 1993 SNA classified illegal activities into two categories:

a. Production of goods and services whose production, sale, or mere possession is forbidden by law

b. Production activities which are usually legal but which become illegal when carried out by unauthorized producers

The 1993 SNA states explicitly that illegal activities should be included in the system of national accounts, noting that "despite the obvious practical difficulties in obtaining data on illegal production, it is included within the production boundary of the System," provided that they are genuine processes whose outputs consist of goods and services for which there is an effective market demand,[6] and that "all illegal actions that fit the characteristics of transactions—notably the characteristic that there is mutual agreement between the parties—are treated the same way as legal actions."[7]

The 2008 SNA emphasizes the need for overall consistency. "Clearly, the accounts as a whole are liable to be seriously distorted if monetary transactions that in fact take place are excluded."[8] Since incomes obtained from illegal production are used for buying legal goods and services or acquiring legal fixed or financial assets and all these transactions are recorded in the accounts along with those that are financed by incomes from legal activities, there is inevitably a discrepancy between supply and uses for the economy as a whole if the production and imports of illegal goods and services are omitted. For the same reasons, the European System of Accounts (ESA) 1995 included illegal production, noting that "All such activities are included even if they are illegal or non-registered at tax, social security, statistical and other public authorities."[9]

In addition to the consistency of the overall system, comparability of national figures between countries and over time is another major reason for the inclusion of illegal activities. Some activities such as the production and distribution of alcohol and prostitution may be illegal in one country and legal in another. Hence, exclusion of illegal production can distort international comparisons. Likewise, it will give rise to distortions over time if some activities switch from being illegal to being legal, or vice versa. Production and distribution of alcohol during the Prohibition Era in the USA is an example.[10]

However, for practical reasons and due to a severe lack of data, very few countries explicitly include estimates of illegal production in their national figures. Within 56 ECE (United Nations Economic Commission for Europe) member countries, only five countries include allowances

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5   Ibid., 34.
6   Inter-Secretariat Working Group on National Accounts, United Nations, Commission of the European Communities, International Monetary Fund, Organisation for Economic Co-operation and Development, and World Bank. 1993. System of national accounts 1993. Brussels/Luxembourg: Commission of the European Communities: 126.
7   Ibid., 38.
8   United Nations, European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, and World Bank. 2009. System of national accounts 2008. New York: United Nations, 48.
9   Havinga, Ivo, Gulab Singh, Herman Smith, and Viet Vu. 2006. Illegal activities in the 1993 SNA. Geneva: UN, 8.
10   Measuring the Non-Observed Economy, 151.

for the illegal economy in their published GDP estimates. Bulgaria estimates the value of drug consumption; the Czech Republic includes estimates for prostitution and the sale of stolen goods; Estonia's GDP includes estimates for prostitution, trade in drugs, and audio-video products in the households final consumption expenditure aggregates; Slovakia includes estimates for trafficking and distribution of drugs and prostitution; and the United Kingdom includes consumption of smuggled alcoholic drinks and tobacco products in its GDP estimates.[11]

3. Measurement of Illegal Economic Activities

By their nature, illegal activities are difficult to measure because they are usually carried out in ways that attempt to hide them. The more the activities are considered unacceptable by law or by the general public, the more difficult it becomes for conventional data sources to capture them. The most useful approach is to use the most basic principle in accounting: that the balance sheet must balance. That is, the supply of goods and services must equal the use of goods and services. Efforts to quantify such activities rely on sources such as information from police, health authorities, customs authorities, crime statistics, public opinion polls and other data (internet, radio, TV, newspapers), experts' estimates, and assumptions.[12]

3.1 Measurement of Prostitution Services

In the handbook *Measuring the Non-Observed Economy*, the Organization for Economic Co-operation and Development proposes a way to measure the prostitution market by measuring its total supply.[13] The total supply of prostitution services comprises services produced domestically by residents and by nonresidents and imported services(e.g., prostitution services purchased by residents traveling abroad). Information on domestic output of prostitution services can be collected from health care organizations, police or prostitutes' associations, or special studies by universities and research institutes. When reasonable estimates of the number of prostitutes are found, multiplication of the number by estimates of the average number of clients and the average price may provide a good approximation of the total domestic supply of prostitution services. Because the prices of different kinds of prostitutes differ substantially, a breakdown into different kinds of prostitutes is necessary.

TOTAL SUPPLY

$$= \sum_{i=1}^{n} \textbf{Price}_i * \textbf{Average Number of Clients per a Prostitute}_i * \textbf{Number of Prostitute}_i$$

(i= 1~n designates different types of prostitution services in which a prostitute provides)

3.2 Measurement of Prostitution Services in the UK and Poland

There have been attempts to measure the size of prostitution markets in the United Kingdom and Poland. Work published in the July 1998 edition of *UK Economic Trends* suggests broad estimates of illegal activities shown in Table 1.

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11   United Nations, European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, and World Bank. 2009. System of national accounts 2008. New York: United Nations, 10.

12   Ibid.

13   Measuring the Non-Observed Economy, 157.

TABLE 1
MEASUREMENT OF ILLEGAL
ACTIVITIES IN THE UK, 1996

	Value Added *(percent 1996 GDP)*	*Consumers Expenditure* *(percent 1996 Consumers Expenditure)*
Drugs	0.5-1.1	0.9-2.1
Prostitution	0.2	0.2
Selling stolen goods	0.1	0.1
Illegal gambling	0.1	0.2
Total	0.9-1.5	1.4-2.6

Note: Data from the July 1998 edition of *UK Economic Trends*

In Poland, a 1996 police report concerning one town estimated that the approximate number of prostitutes in Poland in 1998 was 26,000.[14] The annual supply of prostitution services was estimated based on assumptions for the services provided per day, and the number of working days each month. The supply of services estimated was compared with estimates of demand, calculated on the assumption that five percent of the male population between the ages of 18 and 60 use prostitution services. Information on prices for 1996 was obtained by interview. Movement in the consumer price index was used to estimate prices for 1998. The results of the estimation are shown in the Table 2.[15]

TABLE 2
ESTIMATE OF THE VALUE OF
PROSTITUTION SERVICES SPECIFICATION
IN 1998

Total number of services available per year	12704400
Price per service (zl: zloty)	120
Value of services: **(output in thousands zl)**	1114100
Imports (thousands zl)	171000
Households' consumption **(thousands zl)**	1285100
GDP (current prices, national currency) for Poland **in year 1998 (zl)**	600.902 Billion
% of GDP	0.21%

Note: Data from Measuring the Non-Observed Economy: A Handbook (2002)

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14   System of National Accounts 2008 (EC, IMF, OECD, UN & World Bank, 2009), 189.
15   Ibid, 190.

3.3 Prostitution Market in South Korea and Its Measurement

Although prostitution is illegal in South Korea, the prostitution market has flourished. The government strengthened regulations on prostitution activities in 2004. Nevertheless the prostitution market was still in high demand. Recently, the number of South Korean women looking for work as prostitutes abroad—in the United States, Australia, and elsewhere—has increased. An estimated 17% of prostitutes in Australia are South Korean women.[16] According to research conducted by the Ministry of Gender Equality and Family in 2007, about 270,000 women work as prostitutes in South Korea, which equals about 4.1% of South Korean women between the ages of 20 and 30 years old.[17] As a result of a serious unemployment crisis which has continued since the 1997 financial crisis, young women in their twenties have been looking for full- or part-time jobs in the prostitution market, in which they can easily earn money. Recently, the owner of the biggest hostess bar in South Korea, YTT, was indicted on charges of tax evasion and breaking the prohibition law on sex trafficking. YTT is known to have 1,000 employees, sell prostitution services about 44,000 times annually, and generate annual revenue of $80 million.[18] Prostitution service providers are becoming more commercialized and amalgamated. The Ministry of Gender Equality and Family in 2007 attempted to measure the supply of prostitutes in South Korea. The estimate was 14 trillion South Korean won, which equals 1.7% of the country's 2006 GDP.[19]

TABLE 3
Estimate of the Value of
Prostitution Services Specification
in 1998

Type of Business	Estimates			
	Number of Businesses	*Number of Prostitutes*	*Number of Sex Buyers (unit: 10000 persons)*	*Volume of Total Prostitution Market (unit: $100,000)*
Full-time business	1,443	3,644	251	2,068
Sideline business	44,804	147,392	5,010	76,865
Internet-based or other types	36,337	118,671	4,134	62,019
Total	82,584	269,707	9,395	140,952

Note: Data from 전국성매매실태조사 **(A Study on the Prostitution in South Korea) (2007)**

Although there have been attempts to measure the size of the prostitution market in South Korea by measuring the total supply, there has been little effort to measure the size of the prostitution market in South Korea by measuring the total demand. Measuring the total supply of the prostitution market has its difficulties because the prostitution service business is more

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16   Lee, Hyo-sik. "Over 1,000 Korean Women Are Prostitutes in Australia." *The Korea Times*, Nov. 4 2011, http://www.koreatimes.co.kr/www/news/nation/2011/11/117_98737.html (accessed 5 Dec. 2012)

17   Byun, Wha-soon, A Study on the Prostitution in Korea (Rep. Seoul: Ministry of Gender Equality and Family, 2007), 85.

18   Kim, Rahn. "'Room Salon King' Faces Arrest." The Korea Times, 31 Aug. 2012. http://www.koreatimes.co.kr/www/news/nation/2012/09/117_118746.html (accessed 5 Dec. 2012)

19   Byun, Wha-soon, A Study on the Prostitution in Korea, 370.

diversified and hidden. As a result, it is hard to estimate the total number of prostitutes and suppliers.

According to the South Korea's Supreme Prosecutor's Office's publication of crime data for 2004-2011, the number of arrests for breaking laws banning prostitution and sex trafficking has decreased sharply as of late.[20] A large fluctuation in the number of people arrested means that it is harder to estimate the size of the prostitution economy in relation to its total supply.

TABLE 4
Police Office Data on Annual
Arrest for Prostitution and Sex
Trafficking Crimes

Years	*Number of arrest cases*	*Number of people arrested*
2004	830	2,475
2005	3,439	13,093
2006	6,886	26,631
2007	7,829	31,203
2008	15,873	46,041
2009	24,424	65,621
2010	9,016	17,048
2011	5,928	8,795

Note: Data from South Korean National Police Agency's publication of 2004-2011

4. Survey Method

4.1. Unrelated Question Randomized Response Model

To overcome subjects' fear that their responses can be traced to them, a phenomenon which leads to underreporting, I used a randomized response survey. For various reasons, individuals in a sample survey may prefer not to confide to the interviewer the correct answers to certain questions. Refusals to respond or intentionally misleading replies are known to be two of the main sources of non-sampling bias in sample surveys of human populations. Recognizing that these two sources of error are more frequent when the respondents are asked about sensitive or highly personal matters, Warner developed an interviewing procedure or technique called the "randomized technique" designed to reduce or eliminate these biases.[21] The respondent selects a question on a probability basis from two or more questions without revealing to the interviewer which of the alternative questions has been chosen. The individual replies, which must be "yes" or "no" to each question, are of no certain meaning for a specific respondent,

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20   Supreme Prosecutor's Office Republic of Korea, 2004~2011 Crime Analysis Reports, http://www.spo.go.kr/spo/info/stats/stats02.jsp (accessed 3 Dec. 2012)

21   Greenberg, Bernard G., Abdel-Latif A. Abul-Ela, Walt R. Simmons, and Daniel G. Horvitz. 1969. "The Unrelated Question Randomized Response Model: Theoretical Framework." Journal of the American Statistical Association. 64 (326): 520.

but provides useful information for estimating the proportion of the population that has the "sensitive characteristic."[22] When this characteristic is concerned with illegal behavior including seeking the service of prostitution, the respondent is protected in the confidentiality of the reply.

Among the many different models derived from the "randomized response" technique, I used the unrelated question randomized response model set up by Warner and Horvitz which uses two questions—the sensitive question and an unrelated question—along with a randomization device to determine the question that the respondent should answer. I particularly used the case when the true proportion of the unrelated characteristic is known, which is analyzed in the article "The Unrelated Question Randomized Response Model: Theoretical Framework." Suppose the neutral question introduced into the survey involves a characteristic Y whose true proportion π_Y is known in advance. I used as a neutral question the probably unrelated statement, "The second hand of your watch or clock around you is between 0 and 30" to which the respondent is supposed to reply simply "yes" or "no." Since π_Y approximates 50% when the sample size is large enough, there is now only one parameter to estimate. Thus, I have

$$\gamma_1 = p_1(\pi_A - \pi_Y) + \pi_Y \quad \text{or} \quad \gamma_1 = p_1\pi_A + \pi_Y(1 - p_1).$$

Thus,

$$(\pi_A|\pi_Y)_U = \frac{\gamma_1 - \pi_Y(1 - p_1)}{p_1}, \text{Var.}(\pi_A|\pi_Y)_U \frac{\gamma_1(1 - \gamma_1)}{np_1{}^2}$$

For example, the first question in my survey is "Q1: Have you sought the service of the prostitution before? Q2: Is the second hand of your watch or clock around you between 0 and 30?" The respondent flips a coin and decides which question to answer whereas I do not know the outcome of the coin.

FIGURE 1
Tree Diagram Expressed in Terms of Probability of "Yes"

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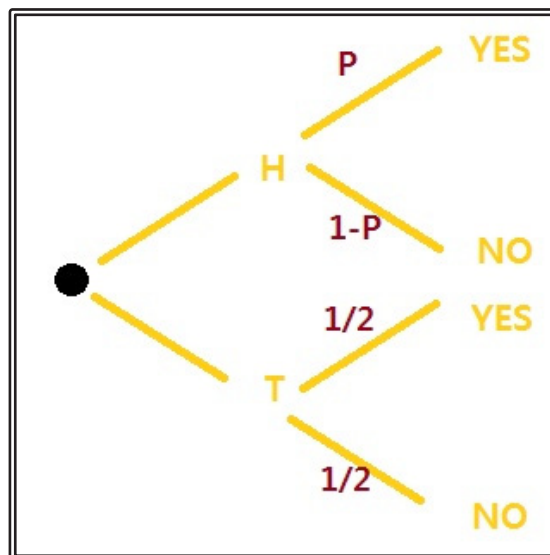
22   Ibid., 521.

Therefore, in my survey, an estimate for mean and variance appears below.

$$\frac{n1}{n} - \frac{\hat{p}}{2} + \frac{1}{4}$$

$$\hat{p} = 2 \left(\frac{n1}{n} - \frac{1}{4} \right)$$

$$\text{Var} \left(\hat{p} \right) = \frac{4}{n} \times \frac{n1}{n} \times \left(1 - \frac{n1}{n} \right)$$

(n1 denotes the number of "yes" answers in *n* subjects)

4.2 Stratified Random Sampling and Recruitment

If there are difficulties in sampling individuals at random, these difficulties can be greatly diminished when we adopt groups as the elements of sampling. This can save the time and labor of random sampling. According to Adolph Jansen, the representative statistical method includes two methods different in nature and in accuracy.[23] The first method is "inquiry by random selection," which depends on Bernoulli's law. The Bernoulli distribution is a discrete distribution having two possible outcomes labeled by n=0 ("failure") and n=1 ("success") in which n=1 occurs with probability p and n=0 occurs with probability 1–p , where 0<p<1.[24] I should have access to every person of a population with whom I am concerned and I should be able to make a selection at random of some of these persons or things in such a way that every person has an equal chance of being selected, while the method of selection is completely independent of the characteristics to be examined.

In the second method, which Jansen calls "the method of purposive selection" and that we now call "stratified random sampling," we select not individuals but groups or districts. Districts or groups (e.g., geographical areas, age groups, genders) are selected that together yield the same averages or proportions as the whole country or population with respect to those quantities or qualities that are already a matter of statistical knowledge, and a sample is randomly taken from each stratum.[25] The results from each stratum may be of intrinsic interest and can be analyzed separately. It is assumed that the districts or groups taken together will be typical of the whole. By this procedure the sample may be said to be selected at random, in as much as every district or every group of persons has an equal chance of inclusion.

Jansen notes in his paper that the circumstance that the sample is composed of groups of units may mean a much less representative dispersion of the units that make up the sample, and the chance of obtaining a truly representative sample is therefore not the same as when each single unit is selected at random.[26] One can increase certainty by selecting two or more independent samples and comparing their results statistically. If this handling of the different samples gives entirely, or approximately, the same results, there is great probability that these

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23   Jansen, Adolph, Report on the Representative Method in Statistics (Bulletin De L'Institut International De Statistique 22, 1925), 365.

24   Weisstein, Eric W. "Bernoulli Distribution." From MathWorld—A Wolfram Web Resource. http://mathworld.wolfram.com/BernoulliDistribution.html

25   Jansen, Adolph, Report on the Representative Method in Statistics, 368.

26   Ibid., 370.

results do not differ to any noteworthy degree from those which would have been arrived at by dealing with the whole.[27]

I will denote the Korean adult male population by π. Its elements will be single Korean adult males, of which I shall consider a certain character x (e.g. if one sought the services of prostitutes at least once in one's lifetime). Suppose I want to estimate the average value of the character x, say X, in all individuals forming the population π.Since x is an attribute, which may be possessed or not by the individuals of the population, its numerical value in these individuals will be 0 or 1, and its mean value X will be the proportion of the South Korean adult males who sought the services of prostitutes at least once in their lifetimes.

Before drawing the random sample from the population π, this population is divided into several "strata," say π_1, π_2, ... , $\pi_5$which represents age groupsand the sample sigma is composed of 5 partial samples, say $\Sigma_1, \Sigma_2, ... , \Sigma_5$, each being drawn from one or other of the strata. Suppose that these groups contain respectively v_1, v_2, ... , $v_M$individuals and that the sums of the x's corresponding to these individuals are $u_1, u_2, ... , u_M$,

With this notation I shall have

$$\mathbf{M'= v_1 + v_2 + \ldots + v_M = \Sigma(v)}$$

$$\mathbf{\Sigma^{M'}_{i=1}(x_i)= u_1 + u_2 + \ldots + u_M = \Sigma(u)}$$

The problem of estimating X is now identical with the problem of estimating the character of the population π, namely

$$\mathbf{X= \frac{\Sigma(u)}{\Sigma(v)}}$$

Using the above concept of stratified sampling, I recruited for the survey. I set strata by the criteria of age and employment status. To represent the general South Korean adult male population, I asked approximately 1,000 public servants, 1,600 professional workers (lawyers, doctors, and professors), 900 college and graduate students, 800 major company employees, 1,500 employees from small- and medium-sized companies, 1,000 private business owners, 200 part-time workers, and 400 retired workers to participate in the survey by e-mail. I obtained these contacts through acquaintances and friends. In total, I asked more than 7,400 people to participate in this survey. The number of subjects was 471, and the estimated response rate was 6.3%. Additionally, I conducted a survey of 52 users of online communities of sex buyers and conducted a smart phone application-based paid survey of 200 panels using the direct response random sampling method to compare the results of stratified random sampling survey and random sampling survey.

4.3 Survey Question Strategies

I used the forgiving wording strategies in an attempt to improve reporting of sensitive information. Most of the standard texts on writing survey questions recommend "loading" sensitive behavioral questions to encourage respondents to make potentially embarrassing admissions (e.g., Fowler, 1995, pp. 28–45; Sudman & Bradburn, 1982, pp. 71–85). For example, the question might presuppose the behavior in question ("How many cigarettes do you smoke each day?") or

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27   Ibid., 372.

suggest that it is quite common ("Even the calmest parents get angry at their children sometimes. Did your children do anything in the past seven days to make you yourself angry?").[28] Catania et al. (1996) carried out an experiment that produced some evidence for increased reporting with forgiving wording of the sensitive questions than with more neutral wording.[29]Applying the forgiving wording strategies, I used the phrases: "the service of prostitution" and "how much do you spend on seeking the service of prostitution annually?" in my survey.

5. Hypotheses and Results

I began by examining whether responses to the RR technique were similar to those to the DR technique. If RR surveys induce more truthful responses from participants engaged in illegal behaviors, I should find that a larger proportion of respondents answered "yes" to the sensitive questions. Accordingly, I formulated the following null hypothesis:

$$(\text{H1})\ \mu_{RRi} = \mu_{DRi}$$

$\mu\mu_{RRi}$ and ($\mu\mu_{DRi}$ represent the computed mean response to sensitive question i under each the random and the direct response format. The null hypothesis in (H1) states that the proportion of "yes" responses to the sensitive questions is equivalent across the two survey methods. Rejection of (H1) and a finding that

$$\mu\mu_{RRi} > \mu\mu_{DRi}$$

could imply that a number of participants felt protected by the RR questionnaire design and provided more accurate answers. Table 3 contains descriptive statistics for the two questions.

TABLE 5
SUMMARY STATISTICS OF RESPONSES

|	Question:	Have ever sought the services of a prostitute? (percentage "yes")	Have you frequently (more than three times each year) sought the services of a prostitute? (percentage "yes")
	Survey Group		
1.1	**Randomized response**	**0.646**	**0.403**
		(.0991)	(.0997)
	Number of observations	239	239
1.2	**Direct response–A**	**0.508**	**0.239**
		(0.501)	(0.456)
	Number of observations	232	232
1.3	**Direct response–B**	**0.44**	**0.25**
		(0.498)	(0.435)
	Number of observations	100	100

Note: Direct response–A is a stratified random sampling online survey I conducted, and Direct response–B is a paid survey using a smart phone application

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28   Tourangeau, Sensitive Questions in Surveys, 16.

29   Catania et al. Effects of interviewer gender, interviewer choice, and item wording on responses to questions concerning sexual behavior (Public Opinion Quarterly, 60 1996), 345.

I found statistical differences between answers obtained in the DR and RR survey techniques using standard large-sample one-tailed t-tests. First, I compared the randomized response and direct response–A surveys. A difference in responses to the first question was significant at the 5% level (P-value= 0.0486), and a difference in responses to the second question was significant at the 10% level (p-value= 0.0620). I then compared the randomized response and direct response–B surveys. A difference in responses to the first question was significant at the 1% level (P-value= 0.0073), and a difference in responses to the second question was significant at the 1% level (p-value= 0.0092). The respondents were acting heterogeneously across survey instruments. One possible explanation of the difference in responses between Direct Response A and B surveys is that panels' concern about anonymity and confidentiality in a paid survey is higher than in an online survey since panels' personal information and their survey responses are recorded and saved by the paid survey company.

FIGURE 2
Mean Responses to Sensitive Questions in Different Surveys
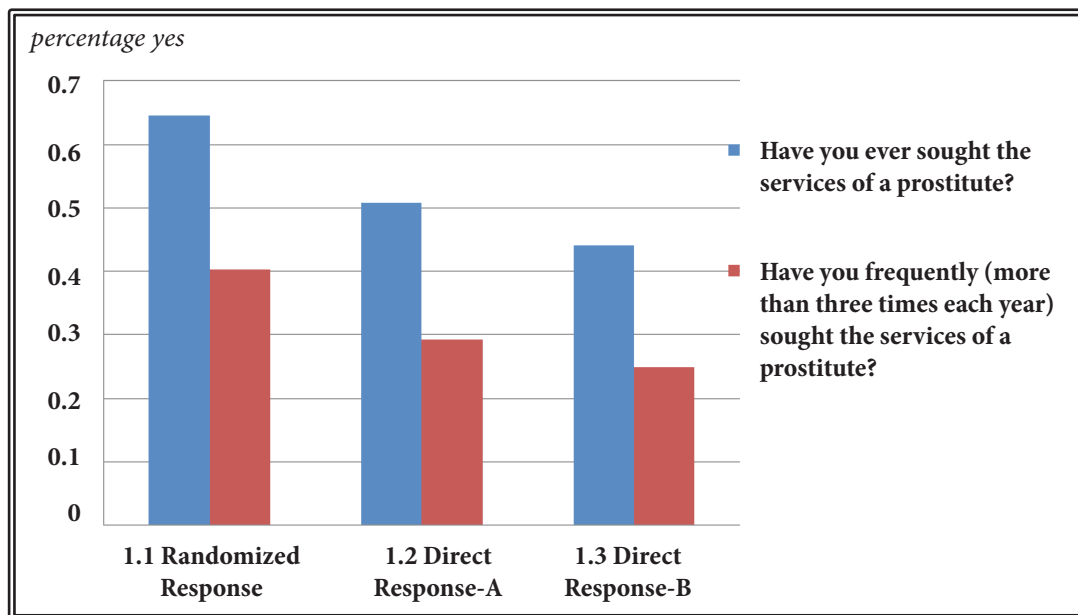
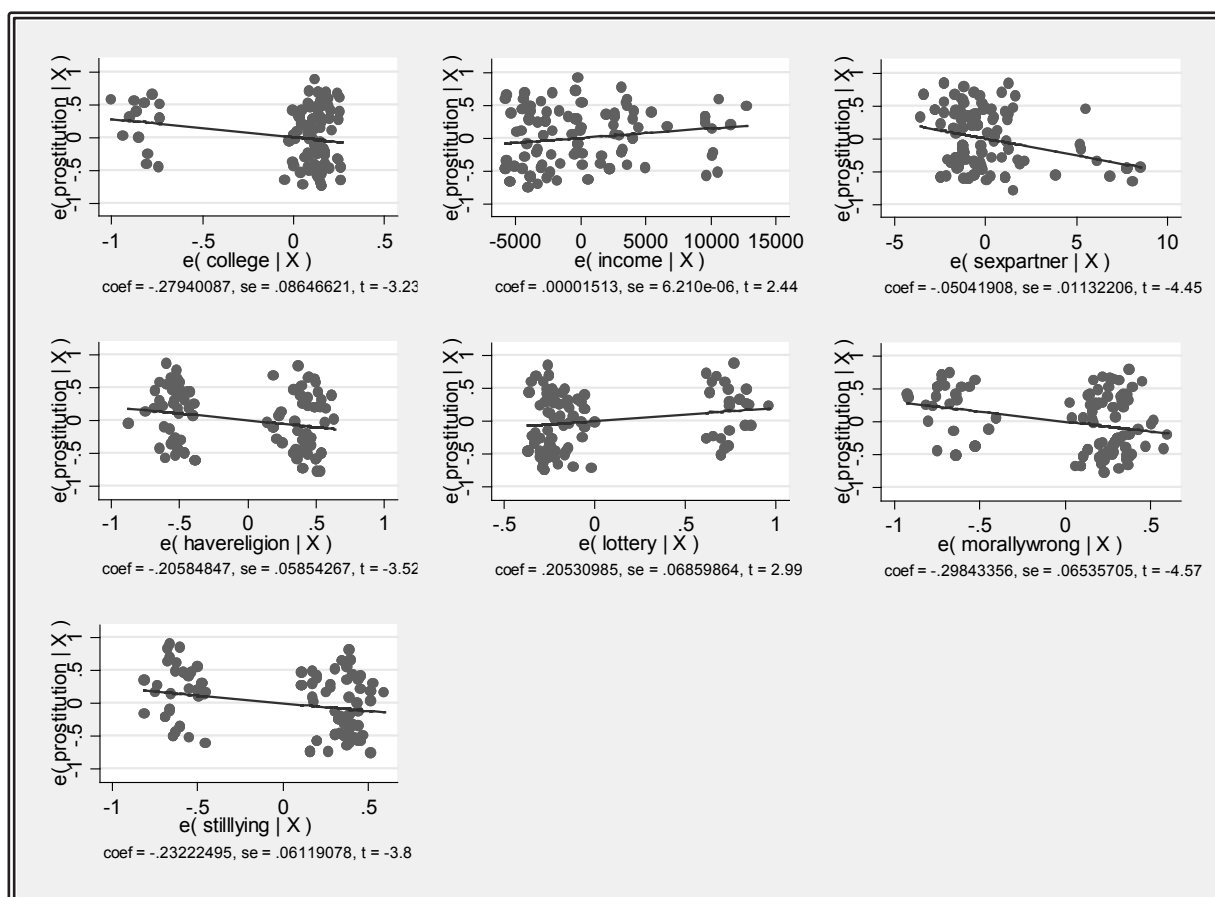Next, I explored the determinants of demand for services of prostitutes.

(H2) $Y_i = f(X_i)$

where Y_i takes on a value of 1 if person i has ever sought the prostitution service before and 0 if not, and X_i is a vector of regressors presumed to affect the probability of seeking services of prostitutes. The null hypothesis of H2 premises that prostitution service-seeking behavior is not a function of income level, education level, number of sex partners, individual risk aversion, or presence or absence of religious belief. If (H2) is rejected, important relationships can be conjectured about demand for the prostitution service and the regressors.

TABLE 6
Empirical Estimates of the Determinants of Prostitution Services-Seeking Behavior

Specification:	OLS Regressions		
Dep. Var.:	Dependent variable = 1 if respondent answered yes in question 1, 0 otherwise.		
	(1)	*(2)*	*(3)*
College Education	-0.095	-0.2794 ***	-0.203 **
	-0.0818	-0.0864	-0.0892
Income Level	0	0.0000151 ***	0.0000156 **
	-0.000004	-0.000006	-0.000006
Sex Partner	-0.0009139	-0.0510213 ***	-0.0412167 *
	-0.0114	-0.0114	-0.0123
Religion	-0.0060496	-0.2058 ***	-0.1827922 **
	-0.0699	-0.0585	-0.0664
Risk Aversion	-0.03524	0.2053 ***	0.208605 **
	-0.0913	0.0686	0.0768
Moral Perception	-0.00245	-0.2984 ***	-0.1804555 **
	-0.0745	0.0653	0.0808
Trus in the Survey	-0.0889861	-0.2322 ***	-0.1437105 **
	-0.0677	-0.0611	-0.0692
N	N = 239	N = 232	N = 200
F-Test	F (7, 233) = 0.67	F (7, 222) = 12.58	F (7, 190) = 6.65
	Prob > F = 0.6437	Prob > F = 0.0000	Prob > F = 0.0000

Note: * significant at 10%; ** significant at 5%; * significant at 1% (1): Randomized Response (2): Direct Response Type A (3) Direct Response Type B**

FIGURE 3

ADDED-VARIABLE PLOTS

coef = -.27940087, se = .08646621, t = -3.23

coef = .00001513, se = 6.210e-06, t = 2.44

coef = -.05041908, se = .01132206, t = -4.45

coef = -.20584847, se = .05854267, t = -3.52

coef = .20530985, se = .06859864, t = 2.99

coef = -.29843356, se = .06535705, t = -4.57

coef = -.23222495, se = .06119078, t = -3.8

I also tested whether South Korean adult males who had no sex partners during the past three years were more likely to seek the services of prostitutes.

(H3) $\mu_{Ys} - \mu_{Yn} = 0$ for s=0

(μ_{Ys} represents the mean response to question 1 by men who had no sex partner for the last three years; μ_{Yn} represents the mean response to question 1 by men who had at least one sex partner in the last three years.)

The t value is 2.22 and the one sided p-value is 0.0139. Hence, the null hypothesis is rejected, and it is estimated that South Korean adult males who had no sex partners during the past three years were more likely to seek the services of prostitutes.

6. Total Demand for Prostitution Services in South Korea

Using the results of the survey, I examined the total demand for prostitution services. Based on responses to the direct response survey, I estimated the average amount of money a South Korean adult male spends on prostitution services according to age. I then compared how much DR survey responses are biased downward compared to RR survey responses. Comparing the

responses to questions 1 and 2 from the direct and randomized response surveys, I adjusted the average amount of money a South Korean adult male spends on prostitution services according to age. Using the 2010 South Korean male population data, I multiplied the number of South Korean males per age level by the adjusted average amount of money a South Korean adult male spends on prostitution services according to age.

TABLE 7
Estimated Average Amount Spent on Prostitution Services per One Person per Year

Age Group	*Amount Spent on Prostitution Services per One Person per Year (unit: 10,000 Won)*
20-30	48.11
30-40	113.33
40-50	165.33
50-60	35.86
60-70	12.42

TABLE 8
Age Level Distribution

| *2010 South Korean Male Population*			*Direct Response Survey Subjects*		
Age Group	*Number of Individuals*	*Percentage of Population*	**Age Group**	*Number of Individuals*	*Percentage of Population*
20-29	3428000	19.83%	**20~29**	65	30.95%
30-39	3926000	22.71%	**30~39**	51	24.28%
40-49	4116000	23.81%	**40~49**	48	22.85%
50-59	3247000	18.79%	**50~59**	53	25.23%
60~70	2563171	14.83%	**60~70**	17	8.09%
20~70	17280171	100%	**20~70**	232	100%

Note: South Korean male population data from 2010 *South Korean Population Census*

I set the equation of total demand of prostitution services as

$$\sum_{i=1}^{6} (Y_i * X_i * AD)$$

(Y_i is the number of South Korean adult males per age group. X_i is the average amount a South Korean adult male spends on prostitution services per age group. AD is a number to adjust for bias.)

FIGURE 4
PROSTITUTION OF MARKET
SHARE DEMAND (%)
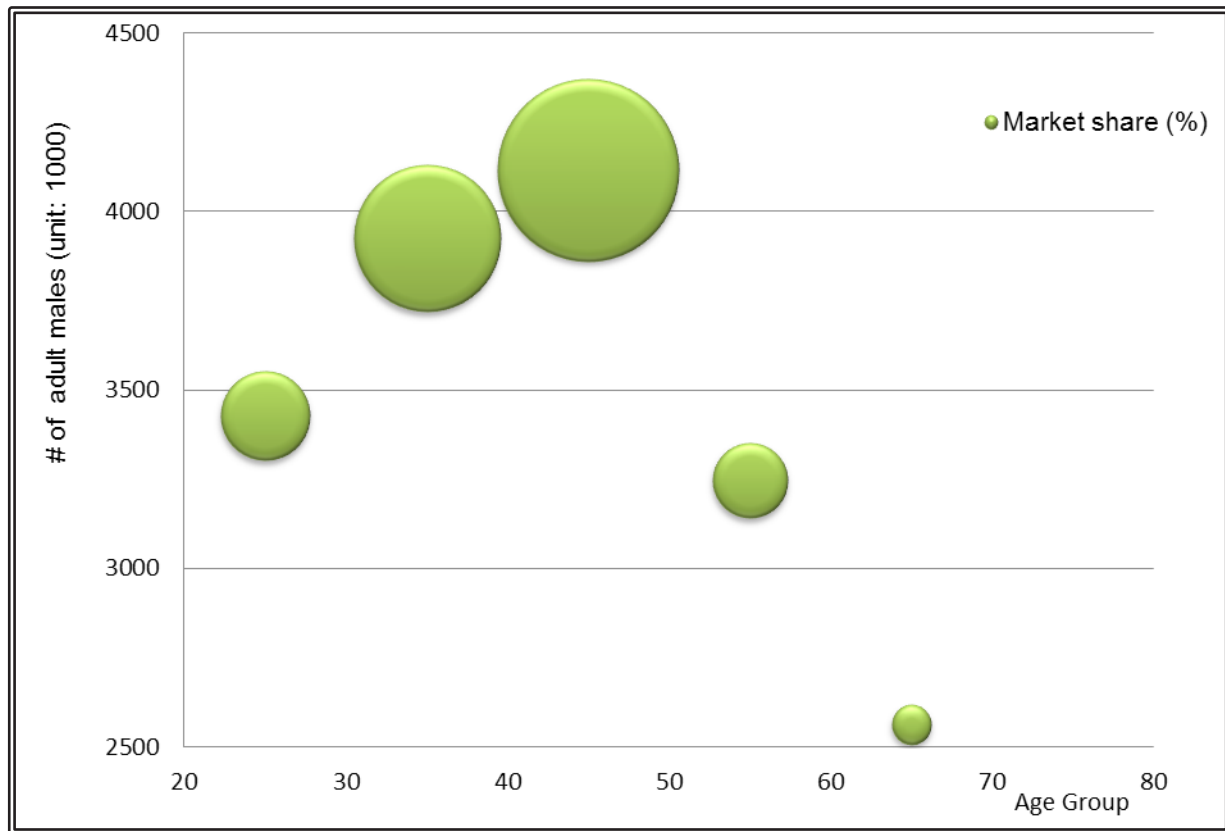
By calculation, the size of total demand for prostitution services is 20,551,784,911,714 South Korean won. The calculation is like the below.

20,551,784,911,714=10,000*(1/0.7)*(48.11*3,428,000+113.33*3,926,000+165.33*4,116,000+35.86 *3,247,000+12.42*2,563,171)).

Since South Korea's 2011 GDP is 1,237,128,000,000,000 South Korean won,[30] the estimated total supply of prostitution services in South Korea,20.55 trillion won ($18 billion),equals about 1.66% of South Korea's GDP.

7. Other Test Results

7.1. "The Wisdom of Crowds" or Collective Intelligence

The "wisdom of crowds" is the name of James Surowiecki's argument that the aggregation of information in groups results in decisions that are often better than could have been made by any

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30   Bank of Korea, GDP data, http://www.index.go.kr/egams/stts/jsp/potal/stts/PO_STTS_IdxMain.jsp?idx_ cd=2736 (accessed 5 Dec, 2012)

single member of the group. This simple idea can be applied in many fields such as economics. For example, since 1988, the University of Iowa has run the Iowa Electronic Markets, which allow people to bet on the outcome of presidential elections.[31] As a predictor, the Iowa Electronic Markets have produced extraordinarily accurate judgments, often doing better than professional polling organizations. Surowiecki argues that "chasing the expert is a mistake and a costly one. . . . [W]e should stop hunting and ask the crowd instead. . . . [C]ollective wisdom will be smarter than an expert's."[32]

In the surveys, I asked people, "What percentage of the South Korean economy do you believe the prostitution market equals?" and "What percentage of the South Korean economy do you believe the automobile market equals?" The table below is a summary of results.

TABLE 9
The Wisdom of Crowds Test Results

	The Wisdom of Crowds in the Survey	*Real Value*
Automobile industry/GDP	3.019	4.23
Prostitution Market/GDP	1.354	?

Notes: Automobile industry's share of South Korean GDP data from Bank of Korea report (2011)

By using the wisdom of crowds test, I estimated the size of the prostitution market to be 1.354% * (4.23/3.019) = 1.89 % of the South Korean economy.

7.2 Price Elasticity of a Prostitution Service

According to the survey data, demand for prostitution services is relatively inelastic while demand for prostitution services is more elastic for more frequent buyers.

TABLE 10
Price Elasticity of
Prostitution Services

Price Elasticity for Average Buyers		*Price Elasticity for Frequent Buyers*	
% Change in price of prostitution service	*% Change in quantity demanded*	*% Change in price of prostitution service*	*% Change in quantity demanded*
(-) 30%	(+) 30%	(-) 30%	(+) 51%
(-) 50%	(+) 81%	(-) 50%	(+) 106%
(+) 50%	(-) 40%	(+) 50%	(-) 45%

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31   James Surowiecki. The Wisdom of Crowds (Anchor, 2005), 18
32   Ibid., 31

8. Concluding Remarks

In this paper, the total demand for prostitution services in South Korea is estimated to be 20.55 trillion won ($18 billion), which equals about 1.66% of South Korea's GDP. If this survey is funded and conducted through a more elaborate process, more thorough statistical results could be obtained and used to reflect the unobserved economy of South Korea and South Korea's GDP. It is not necessary to conduct annual surveys. If the government conducted a survey once every five years, it would be possible to estimate the size of the prostitution market because the demand for prostitution services is fixed or inelastic unless there is a significant change in prostitution policies or laws.

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Appendix

Randomized Response Survey

(This survey was originally issued in South Korea, and this is an English translation.)
The design of this questionnaire ensures your complete anonymity. Please circle the appropriate answer.

Step 1

Please secretly flip a coin one time. Note whether the coin comes up heads.

If you do toss heads, please answer question 1 below and if you do not toss heads, then please answer question 2:

Q1: Have you sought the service of prostitution before?

Q2: Is the second hand of your watch or clock around you between 0 and 30?

Yes No

Step 2

Please secretly flip a coin one time. Note whether the coin comes up heads.

If you do toss heads, please answer question 1 below and if you do not toss heads, then please answer question 2:

Q1: Have you frequently (more than three times each year) sought the services of a prostitute?

Q2: Is the second hand of your watch or clock around you between 0 and 30?
Yes No

Step 3

Please secretly flip a coin one time. Note whether the coin comes up heads.

If you do toss heads, please answer question 1 below and if you do not toss heads, then please answer question 2:

Q1: If you were paid to seek the services of a prostitute (free), would you?

Q2: Is the second hand of your watch or clock around you between 0 and 30?
Yes No

Step 4

Please secretly flip a coin one time. Note whether the coin comes up heads.

If you do toss heads, please answer question 1 below and if you do not toss heads, then please answer question 2:

Q1: If seeking the services of a prostitute is legalized, would you seek the services?

Q2: Is the second hand of your watch or clock around you between 0 and 30?
Yes No

Step 5

Please answer the following questions:

5a. What percentage of South Korean adult males do you believe have sought the services of a prostitute? _____%

5b. How much do you believe South Korean adult males as a whole spend on seeking services of a prostitution annually? _____ won

Step 6

Please answer the following questions:

Do you think prostitution should be legal or illegal? Yes No

Do you think prostitution is morally wrong? Yes No

If legal, would you ever seek the services of a prostitute? Yes No

Do you believe the government should step in and regulate prostitution? Yes No

What percentage of the South Korean economy do you believe the prostitution market equals? _____%

Step 7

1. Your age level: under 20, 20–30, 30–40, 40–50, 50–60, 60 or more

2. Your income: $0–$24,999, $25,000–$49,999, $50,000–$79,999, $80,000 or more

3. What is your religious status?

Catholic, Buddhist, Protestant, atheist, agnostic, or other.

4. Education—the highest level of education you have studied for, attained, or are currently working towards:

Less than high school diploma, High school, Some college, Bachelors degree, Advanced degree (Masters, Ph.D.)

5. What is the result of the following equation: 3+5 = ?

6. What is your employment status:

Employed full-time, Employed part-time, Not employed but looking for work, Not employed and not looking for work, Retired, Student

7. Your job type: professional worker (lawyer, doctor, professor), major company employee, employee from small- or medium-sized company, private business owner, part-time worker, college or graduate student, retired, or unemployed

8. If you have a 0.5 chance of winning $100, or $50 for certain, which would you pick?

1) play the lottery 2) obtain $50 for certain

Thank you very much for your time and your participation in this survey!

Direct Response Survey

This survey ensures your complete anonymity. Please circle the appropriate answer.

Step 1

Please answer the following questions:

Q1: Have you sought the service of prostitution before?

Q2: Have you frequently (more than three times each year) sought the services of a prostitute?

Q3: Have you ever been caught by the police while seeking the service of a prostitute?

Q5: How frequently do you use prostitution services?

Q6: How much do you spend on seeking the service of the prostitution annually?

Q7: If you were paid to seek the services of a prostitute (free), would you?

Q8: If seeking the services of a prostitute is legalized, would you seek the services more if you already are seeking and, if you are not seeking them now, would you begin to seek the services?

Step 2

Please answer the following questions:

Q9. What percentage of South Korean adult males do you believe have sought the services of a prostitute? _____%

Q10. How much do you believe South Korean adult males as a whole spend on seeking services of prostitution annually? _____ won

Q11. Do you think prostitution should be legal or illegal? Yes No

Q12. Do you think prostitution is morally wrong? Yes No

Q13. Do you believe the government should step in and regulate prostitution?
Yes No

Q14. What percentage of the South Korean economy do you believe the prostitution market equals? _____%

Q15. What percentage of the South Korean economy do you believe the automobile market equals? _____%

Q16. What is the result of the following equation: 3+5 = ?

Step 3

Please answer the following questions
1. Your age level: under 20, 20–30, 30–40, 40–50, 50–60, 60 or more

2. Your income: $0–$24,999, $25,000–$49,999, $50,000–$79,999, $80,000 or more

3. What is your religious status?

Catholic, Buddhist, Protestant, atheist, agnostic, or other.

4. Education—the highest level of education you have studied for, attained, or are currently working towards:

Less than high school diploma, High school, Some college, Bachelors degree, Advanced degree (Masters, Ph.D.)

5. What is your employment status:

> Employed full-time, Employed part-time, Not employed but looking for work, Not employed and not looking for work, Retired, Student

6. Your job type: professional worker (lawyer, doctor, professor), major company employee, employee from small- or medium-sized company, private business owner, part-time worker, college or graduate student, retired, or unemployed

7. If you have a 0.5 chance of winning $100, or $50 for certain, which would you pick?

> 1) play the lottery 2) obtain $50 for certain

> Thank you very much for your time and your participation in this survey!