Demand for Outpatient Health Services in Korea

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This study answers the following question based on a theoretical model proposed by Grossman using the 1989 Korean National Health Survey Data: what does the demand for outpatient health services in Korea look like? Two measures of health service utilization are defined in this study: (1) whether a patient used outpatient health services; and (2) the frequency of outpatient health service utilization. The probit model was applied to the first demand equation with a binary dependent variable because it takes advantage of the convenient properties of the normal distribution. For the next demand equation with a continuous dependent variable with selection problem, the two-stage method with maximum likelihood was applied instead of the tobit model because the tobit model was not appropriate under the situation in which censoring occurs mainly because of the choice of the consumers and is not a result of unobservability.

From this study, the following policy implications can be suggested: the significant effect of travelling time demanded for outpatient health service visits for outpatient health services suggests a policy of delivering more services to target groups by improving transportation, or locating closer clinics. In particular, health care facilities and health personnel should be expanded or redistributed to rural areas where distribution of health service resources has been more restrictive. Second, a price policy to reduce economic barriers for entry into the outpatient health service market should be implemented to increase the probability of entry into the outpatient health service market.

❍ Key Word : Demand for Outpatient Health Services, Health Service Utilization, Grossman Model

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I. INTRODUCTION

In 1976, Korea initiated a mandatory social health insurance program with limited population coverage. As the first step, firms with more than 500 employees were required to provide health insurance for their employees. Mandatory health insurance has been expanded gradually since then. In 1988, health insurance coverage was expanded to include non-wage residents who live in rural and fishing areas, and in 1989, to self-employed workers living in urban areas. Thus, Korea achieved universal health insurance coverage for all of its citizens by 1989.

When health insurance was first introduced to a limited number of people, however, it created inequity between the insured and the uninsured. That is, in theory, the introduction of health insurance increased the demand for health care of the insured. This, in turn, increased the price of health care services. So, the uninsured had to pay a portion of the increased price that resulted from the increased demand for the health service of the insured. Much less, the Korean government controlled fees for health services of the insured by setting maximum levels, while leaving fees for health services of the uninsured free to increase. Thus, fees for health services of the uninsured were higher than those of the insured. Moreover, the costs incurred by the uninsured were relatively higher than those of the insured when considering the fact that insurers pay some portion of the costs of the insured. When we consider the fact that the goal of social insurance is to provide people with adequate access to medical care through sharing of risk, the uninsured, it turns out, are unequally treated. In this respect, the expansion of medical insurance to the whole population may be said to resolve the inequality between the insured and the uninsured (Lee, 1987). Also, the rapid expansion in the number of beneficiaries covered has played a central role in improving the health status of Korean people and access to health care (Min, 1984).

Other positive effects of the introduction of health insurance include an increase in health service utilization and a change in the utilization pattern and increased supply of medical care. However, these positive effects, associated with the introduction of National Health Insurance, have become one part of the cause of the rapid growth of health care expenditures[1)] (Lee, 1988). In fact, the major function of insurance is to reduce the financial risk by pooling resources. Hence, the increase in the use of health services due to the introduction of health insurance is a natural phenomenon. The problem relating to an increase in health service utilization is the part of increased health services due to moral hazards, that is, the use of health services in which marginal costs exceed marginal benefits.

Therefore, the problem in connection with the increase of health care expenditures may be solved through the behavioral changes of the consumer who can be modified. Taking this into account, the purpose

1) National health expenditure depends on price and quantity because total expenditure spent on goods equals the amount at which price is multiplied by quantity. The causes of the enlargement of the national health expenditure might result from an increase in price and/or an extension of quantity in health service. There are though fundamental sources for the growth of national health expenditure caused by increases in price and quantity for health service. These sources may be the peculiarities of health services, internal causes of health market such as the characteristics of supplier, consumer and health market, and external causes such as the growth in income or change in structure of a population.

of this study is to analyze the demand for outpatient health services immediately after the introduction of the national health insurance system in order to answer the following question: "What does the demand for outpatient health services look like immediately after the introduction of the national health insurance system in Korea?"[2)]

II. THEORETICAL MODELS

Most of the initial research on the demand for health services was based mainly on the traditional theory of demand, on the two basic assumptions that health services are not different from other goods and services and that the behavior of consumers in health markets can be explained by the standard model of consumer behavior for competitive markets. However, the above simple model does not take into account the characteristics of the health care market such as uncertainty, asymmetric information, external effects, basic human need, consumption and investment elements, derived demand, and time cost (Grossman, 1972). Several economists tried a new approach in several directions to analyzing consumer behavior theory by taking into account the above characteristics of health services (Becker, 1965; Lancaster, 1966; Muth, 1966; and Acton, 1975). They introduced the "time" concept to the consumer behavior theory. In addition to goods

2) It is not possible to evaluate the effect of the introduction of the national health insurance system on demand for health services or compare demand for health services from the period before the national health insurance system with the period after national health insurance system, because the data from the period before the national health insurance system was not available. We can, however, tell what the demand for health services looked like in 1989.

and services, they viewed “time” as an economic subject. According to their theories, households are assumed to combine time and market goods to produce more basic commodities that directly enter a utility function. The concept that health care is not consumed for its own sake but for the sake of its effect on health has emerged explicitly since 1970. Grossman (1972) applied this new theory of demand for health to his study and developed a demand model for health and health services based on Becker’s allocation-of-time and human capital framework.[3)]

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3) In Grossman's theoretical model, individuals are assumed to inherit a stock of health capital. Therefore the health stock changes over time as shown by:

$$K_{t+1}^{h} - K_{t}^{h} = I_{t}^{h} - \delta_{t} K_{t}^{h},$$

where K_{t}^{h} is health stock at the period t, I_{t}^{h} is new investment in health and δ_t is a time-dependent rate of depreciation of health. As seen in the above equation, the amount of health capital investment undertaken in each period, that is, the amount of health services demanded, depends on the stock of health capital in the previous period and on the rate at which it depreciates. Formally, the equilibrium stock of health capital is defined by the condition:

$$\frac{U\phi(1+r)t}{\lambda}\frac{\phi_t}{MC_{t-1}^{h}} + \frac{Wt\phi_t}{MC_{t-1}^{h}} = r + \delta t - \tilde{MC}_{t-1}^{h},$$

where $U_\phi = \partial U / \partial \phi_t$ is the marginal utility of healthy time, W is daily wage rate, λ is marginal utility of wealth, ϕ_t is the marginal productivity of health in creating healthy time, or the number of healthy days generated by a unit of health capital, MC_{t-1}^{h} is the marginal cost of health investment in period t-1, MC_{t-1} is the percentage rate of change in marginal costs between periods t-1 and t, r is interest rate forgone by investing in health capital instead of other assets, $\tilde{\pi}_{t-1}$ (= MC_{t-1}) is percent change in the marginal cost of health investment from the last period to the current period, and δ_t is a time-dependent rate of depreciation of health. From the above equation, Grossman derives the following fundamental relationship: the marginal cost of investments in health must equal the marginal rate of return to those investments. That is, the above equation can be expressed briefly with the following equation:

$$\gamma_t + \alpha_t = r + \delta_t - \pi_{t-1}$$

Even though the main shortcoming of the Grossman model is its strong assumption that consumers are not only certain about the quality of health services at the present, but are also able to judge their quality and benefits in the future (Phelps & Newhouse, 1974), he tried to incorporate health need into his model through health stock and the depreciation rate. The pure investment model predicts the signs of two demographic variables, age as a proxy for the depreciation rate of health capital, and education level as a proxy for human capital. In short, Grossman developed a rigorous model of health and health services which provides a better basis for determining which factors should be included in a demand model for health services. So this study is based on a theoretical model proposed by Grossman (Grossman, 1972).

III. METHODS OF ANALYSIS

1. Research Question

The main research question is "What does the demand for outpatient health services look like immediately after the introduction of national health insurance in Korea"? More specifically, this study

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where $\gamma_t \left(= Wt\phi_t \big/ MC_{t-1}^h\right)$ is the marginal monetary rate of return to an investment in health (monetary return), $\alpha_t \left(= \left\{\left(U\phi(1+r)t / \lambda\right) \big/ \left(\phi_t / MC_{t-1}^h\right)\right\}\right)$ is the marginal psychic return of improved health (consumption return), $\gamma_t + \alpha_t$ represents the total rate of return to investments in health, and $r + \delta_t - \tilde{\pi}_{t-1}$ represents the user cost of health capital in terms of the price of gross investment. If $\alpha_t = 0$, no utility is derived from health services, and it can be treated solely as investment goods: $\gamma_t = r + \delta_t - \tilde{\pi}_{t-1}$. If $\gamma_t = 0$, there is no monetary return associated with investment in health, and it can be treated solely as consumption goods: $\alpha_t = r + \delta_t - \tilde{\pi}_{t-1}$.

addresses the following issues: First, are the demands for outpatient health services elastic[4] with respect to prices and time costs?; Second, is the demand for outpatient health services elastic with respect to income? Third, how does the effects of prices and time costs change just after and 22 years after health insurance is introduced?; Fourth, what are the relations among the types of health services?; and fifth, what effects do other factors such as age, education, and health status have on the demand for outpatient health services?

2. The Sample

Data used for this study are from the 1989 Korean National Health Survey conducted by the Korea Institute for Health & Social Affairs every 3 years since 1983. This survey is a nationwide household interview survey of non-institutionalized civilians and provides national data on the incidence of illness, the prevalence of chronic disease and the utilization of health services. The household interviews were conducted during the 41-day period from October 30 to December 9, 1989. A total of 10,989 households among 11,501 sample households were interviewed with a 95.6 percent response rate.

3. Research Variables

Dependent variables for this study are as follows: (1) whether one used outpatient health services during the last 15 days, which separates outpatient users from nonusers; and (2) the number of outpatient visits (Table 1). Explanatory variables used in this study include price-

4) In general, absolute values of own-price elasticity greater than one are considered relatively responsive and called elastic. Elasticity less than one in absolute value is called inelastic. In the field of health economics, the demand for health services is known to be price inelastic. So it is meaningful to assess elasticities from the present study based on those from the previous studies.

related variables, time variables, sociodemographic variables, health status variables, economic status variables, health insurance variables, regional variables, and regular sources of health services (Table 2).

Price-related variable[5)] is the average out-of-pocket cost per visit for outpatient services. It is calculated by dividing the individual's total outpatient out-of-pocket costs by the number of visits. For nonusers for the last 15 days, prices are estimated from the data of users according

5) In this data set, no direct information on price is available. So we use average outpatient out-of-pocket costs as the price of outpatient health services, which is created by dividing the total out-of-pocket costs of outpatient health services by the number of outpatient visits as in other researchers' studies such as Heller (1982), Kwon (1984), and Noh (1987). But, this variable, average outpatient out-of-pocket cost, may have problems when there is a measurement error in the number of outpatient visits and/or total outpatient out-of-pocket costs used to create it. The first problem is that this newly created variable, average outpatient out-of-pocket cost, is no loner exogenous, that is, this variable may be correlated with an included repressor. The second problem is that the division bias may occur when it is included in the demand equation for the number of outpatient visits. According to Borjas's(1980) study, "The relationship between wages and weekly hours of work: the role of division bias", the division bias may occur under the following situation in which there is a measurement error in a denominator or/and a numerator to calculate the outpatient out-of-pocket costs and this newly created variable is included in the demand equation of one of the denominators or/and numerators. However, his study shows that there is no problem in the estimation if there is no measurement error in the denominator or/and the numerator. In this study, the number of outpatient visits and the total outpatient out-of-pocket costs are 15-day period measures, which have little measurement error. In general, it is known that a 15-day period is a better period to remember what individuals have done than other periods such as one month, two months, six months or one year, so there is little measurement error in the number of outpatient visits and the total outpatient out-of-pocket costs. Another problem, when out-of-pocket costs, travel costs, and other costs per visit such as food and lodging in the equation as an independent variable at the same time are included, it may cause multicollinearity problems. So only the out-of-pocket cost is included in each equation as the price variable.

to the types of health services and regions. The time price required to consume medical care in this study is classified into two parts: travel time costs and waiting time costs. Time price is determined by multiplying the time required consuming medical care times the wage

Table 1. Dependent Variables

Variable Name	Description	Remarks
OP[1)]	Dummy variable: whether individual had at least one outpatient health services instead of no health service use	1=yes 0=no
VST	Total number of outpatient visits including public and private clinics	

Note) This analysis excludes drugstore only users.

rate. Unfortunately, the wage rate is not available in this data set. So time price variable without weighting wage rate in the demand for medical care will be used because the variables relating to wage are not available. However, when we multiply the time by the predicted wage rate, which we estimate by using the instrumental variable estimation, the problem is that the error in estimating opportunity cost (wage rate) may lead to a large bias. In addition to the problem of this bias, the problem caused by using the time variable with a weighted wage rate may be a multicollinearity between time value (=time x foregone income) and cash income. On the other hand, a problem in using the time variable without weighting the wage rate may cause misspecification of the equation, that is, a clearly omitted variable case. Even though we are not sure that this is the case, it is known that the problem from using the time price without weighting the wage rate is smaller than that from using the time price with weighting the wage rate.[6)]

Cross-price and time variables are included in the demand equations for health services, that is, the average amount of out-of-pocket costs and time spent at the alternative source of care are included for estimating the effect of cross-price on the demand for health services. For instance, drugstore out-of-pocket costs and time variables are included in the outpatient demand equations. Their predicted signs depend on whether the relation between drugstore and outpatient health services is a complement or a substitute.

Sociodemographic variables[7)] include age, sex, education, and household size. Age has five dummy variables. According to the Grossman Model, the relation of age and the demand for medical care is expected to be positive, if depreciation rates rise with age. The strength of effect of age on the demand for medical care depends on how highly individuals value their health and the rate of return they receive from the additional purchase of medical care. However, if health status fully reflects the depreciation rates, there should be no effect of age on medical care. Female is a dummy variable for gender that takes the value of 1, and adjusted for possible underlying differences between the sexes in health service utilization. Education of the head of household used as the education variable has 6 categories of no school, elementary school, middle school, high school,

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6) The bias from estimating the wage rate is more serious than the one from misspecification of the equation(Joreskog, K.G., 1977).

7) The number of ineligible persons, who are under 15 years of age, is as many as 27 percent of sample cases (10,735 individuals). So, marital status is excluded because it is difficult to entangle the pure effect of marital status.

technical college, and university and over, which creates 5 dummy education variables where the reference group is no school. These education variables are treated as an efficiency parameter that enhances the ability to produce health. So, the higher the level of education is, the higher is the capacity of producing health. An inverse relation between education and medical care exists if the demand for health is price inelastic. Household size is the number of individuals in the family unit, which might result in a negative effect on the demand for health services because of lower income per capita.

Measures of health status in this data set include chronic illness, disease for 15 days, sick days and perceived health status. However, the inclusion of all health status variables in the demand equation may cause a potential multicollinearity problem. Therefore, to solve the multicollinearity problem, and yield more efficient parameter estimates, as well as more parsimonious models for health service demands, two dummy variables are used from the above variables: if someone has a chronic disease, as well as a disease for 15 days (acute disease), unhealthy perceived health status, and more than 5 sick days, his/her health status is assumed to be bad; if someone has no chronic disease, no disease for 15 days, healthy perceived health status, and no sick days, then his/her health status is assumed to be excellent; otherwise his/her health status is assumed to be normal. Therefore, the health status has three categories of bad, normal, and excellent, which creates 2 dummy variables where the reference group is bad health status. The effects of health status on demand for health services are positive. That is, as health status decreases, the demand for medical care rises.

Table 2. Independent Variables

Variable Name	Definition	Remarks
(Demographic Factor)		
Age:		
0- 4	Dummy variable for 0-4	=1 if age 0-4, 0 otherwise
5-14	Dummy variable for 5-14	=1 if age 5-14, 0 otherwise
15-29		(Reference group)
30-44	Dummy variable for 30-44	=1 if age 30-44, 0 otherwise
45-59	Dummy variable for 45-59	=1 if age 45-59, 0 otherwise
60 and over	Dummy variable for 60+	=1 if age 60 and over, 0 otherwise
Female	Dummy variable for gender	=1 if female, 0 male
Household size	Number of family member	
Education:		
No School		(Reference group)
Elementary School	Years of school 1-6	=1 if elementary school, 0 otherwise
Middle School	Years of school 7-9	=1 if middle school, 0 otherwise
High School	Years of school 10-12	=1 if high school, 0 otherwise
Technical College	Years of school 13-14	=1 if technical college, 0 otherwise
University	Years of school 13 and over	=1 if university, 0 otherwise
Place of Residence:		
Large City	6 special cities	=1 if large city, 0 otherwise
Middle City	Middle city	=1 if middle city, 0 otherwise
Small City	*Eub* region	=1 if small city, 0 otherwise
Rural Area	*Myun* region	(Reference group)
(Health Need Factor)		
Health Status:		
Bad Health		(Reference group)
Normal Health		=1 if normal health, 0 otherwise
Excellent Health		=1 if excellent health, 0 otherwise
(Economic Status Factor)		
Health Insurance Premium	Health insurance premium of household	
(Price-related Factor)		
Outpatient Health Services:		
Out-of-pocket Costs	Average out-of-pocket costs	
Travel Time	Average travel time	
Waiting Time	Average waiting time	
Drugstore Health Services:		
Out-of-pocket Costs	Average out-of-pocket costs	
Travel Time	Average travel time	
Waiting Time	Average waiting time	
Health Insurance:		
Government	Government health insurance	=1 if government, 0 otherwise
Industry	Industrial health insurance	=1 if industry, 0 otherwise
Region	Regional health insurance	=1 if region, 0 otherwise
Medical Aid	Medical aid beneficiary	=1 if medical aid, 0 otherwise
None	no health insurance coverage	(Reference group)
Regular Source of Care:		=1 if yes ,0 no

Health insurance premium for the household, as a proxy for income[8], is included as a continuous variable. Health insurance coverage type is included in demand equations as 4 dummy variables: government health insurance, industrial health insurance, regional health insurance, and medical aid. No insurance is the reference group.[9]

In addition to the variables above, place of residence and regular source of medical care are included. The place of residence variable is coded into four regions according to the size of city: large city, middle city, small (*Eub*) city, and rural (*Myun*) area. The rural (*Myun*) area is the reference group. Regular source of medical care is a dummy variable that takes the value of 1 if the individual has a regular source, and zero if not.

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8) The Health insurance premium variable in this study is treated as exogenous because it does not have an endogeneity problem in Korea, unlike in the United States. The type of health insurance and health insurance premium have an endogeniety problem in the United States because American people can choose health insurance type and cost sharing such as deductible and coinsurance based on their health status or health needs. Korea, however, achieved national health insurance system in 1989 and all Koreans have been covered by four types of health insurance societies. The types of health insurance society are determined by the types of their jobs and the methods to calculate health insurance premium across the types of health insurance are the same except for one type of health insurance society "Regional Health Insurance Society" whose beneficiaries are self-employed persons. But, their health insurance premiums are also based on their incomes. So, the type of health insurance and health insurance premium are treated as an exogenous variable in Korea. Also, health insurance premiums are truly reflective of income.

9) The period for this national health survey was from October to December 1989 after the universal health insurance system was introduced. Therefore, all Koreans must have been covered by health insurance. But 4.7 percent among the people were not covered by health insurance at that survey time period.

4. Econometric Specification and Statistical Method

The probit model will be applied to the first demand equations for outpatient health service use (OP) because it takes advantage of the convenient properties of the normal distribution. For the last demand equation with a continuous dependent variable with selection problem, the tobit model is not appropriate under the situation in which censoring occurs mainly because of the choice of consumers, not a result of unobservability (Maddala, 1985). In reality, there may be a lot of factors that can influence whether to obtain health services and what types of health services to use. Among these factors, the individual's perception of the seriousness of the illness may be an influencing factor. If it is assumed that the type of health services and the amount of health care utilization depends on the seriousness of the illness, there is a relationship between the first decision (selection stage) and the second decision (outcome stage), which results in a correlation between the error term of the first function and that of the second function. Even in the case that there is no relationship between two equations, it seems realistic to assume that there may be some common omitted variables, which causes the error terms of the two decision functions to be correlated (Van de Ven & van Praag, 1981). The basic formulation for this model is as follows:

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\begin{aligned}
& z^* = \alpha' V + u, \\
& z = 0 \ \text{if} \ z^* \leq 0; \\
& z = 1 \ \text{if} \ z^* > 0, \\
& y^* = \beta' X + \varepsilon, \\
& y = y^* \ \mathit{if} \ z = 1 \\
& y \ \text{not observed} \quad \mathit{if} \ z = 0. \\
& \varepsilon, u \sim N[0, 0, \sigma_\varepsilon^2, \sigma_u^2, \rho],
\end{aligned}
$$

where z is a dichotomous dependent variable in the selection equation, which is a realization of the unobserved continuous variable, z^*, having a normally distributed, independent error, ε, with mean zero and constant variance; y is a continuous dependent variable in the outcome equation; and ρ is error correlation. To solve the problem above, we need to model the decisions underlying the individuals' health care utilization. In the case of continuous dependent variable with sample selection, Heckman (1976) proposed the two-stage method. However, Heckman's two-stage estimator involves heteroscedastic errors (the error variance depends on X_i as well as whether y=0 or not) and is very sensitive to the normal distribution assumption. Therefore, we will use the two-stage method with the maximum likelihood estimation (MLE), which is known to be more robust than Heckman's two-stage method (1991).

The following is the log-likelihood function for the two-stage method with MLE:

$$L = \sum_{z=0} \log(1 - \Phi i) + \sum_{z=1} \log \frac{1}{\sqrt{2\pi\sigma_{\varepsilon}^{2}}} - \sum_{z=1} \frac{1}{2\sigma_{\varepsilon}^{2}} (yi - x_i'\beta)2 + \sum_{z=1} \log \Phi \left[\frac{v_i'\alpha + \rho\left(\dfrac{yi - x_i'\beta}{\sigma\varepsilon}\right)}{(1-\rho 2)^{1/2}} \right]$$

It is known that the two-stage estimation is very sensitive to distributional assumptions even though the two-stage method with maximum likelihood is less sensitive than Heckman's two-stage method (Maddala, 1985). [10)] So, for tests for normality and

10) These tests do not require specific alternative formulations of either heteroskedasticity or nonnormal distribution and can be reduced to a simple regression so that they are easy to compute. The underlying idea is to test the moments of the estimated distribution of the standardized residuals from the regression of the latent variable, Y^*, against what they should be if the assumption of normality or homoscedasticity is correct. To implement Chesher and Irish's tests requires the computation of estimates of the first four moment residuals, $\hat{e}^{(m)}$, m=1 to 4. Then the first four moment residuals in the probit model are :

homoskedasticity, the method of Chesher and Irish will be applied. Also, efficiency of the method to correct sample-selection bias will be assessed.[11)]

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where $h(.)$ is the standard normal hazard function $\phi(z)/(1-\Phi(z))$ and $z_i = 0$ if $z_i^* \le 0$ and $z_i = 1$ if $z_i^* > 0$. In the tests for normality and heteroskedasticity of unknown form, the elements of the matrix **R** are $(\tilde{e}^{(1)}x, \tilde{e}^{(2)}, \tilde{e}^{(3)}, \tilde{e}^{(4)})$ and $(\tilde{e}^{(1)}x, \tilde{e}^{(2)}, \tilde{e}^{(2)}xx')$, respectively. After computing the elements of each matrix **R** to test for normality and heteroskedasticity, then, next regress a vector of ones on each **R** and compute the explained sum of squares. This yields the Lagrange Multiplier (LM) statistic, which has a chi-squared distribution. Thus, if the value of the LM statistic exceeds the critical value, the null hypotheses of normality and homoskedasticity can be rejected. According to the results of nomality and heteroskedasticity tests in this study, Lagrange Multiplier statistics for each test were zero. This means that normality and homoskedasticity for this data could be accepted. However, White (1978) points out that some package will not apply OLS when the dependent variable is constant. This seems to be the case because the R-squares for these two tests are zeros.

11) According to Nelson (1984), bias in OLS coefficients will increase when neither of the following two conditions are met: (a) if the error correlation, ρ, is zero; or (b) if the estimate of λ is not correlated with the explanatory variables in the outcome equation. However, the error correlation between the selection equation and outcome equation, ρ, is 0.986 in the demand equation for the number of outpatient visits given outpatient health service use, and R-square for regressing λ on the explanatory variables in the outcome equations is 0.983 for the demand equations for the number of visits. When OLS is used for estimating the above demand equations for the number of outpatient visits, OLS estimators are underestimated by -0.412. Also, we compared the results from the two-stage estimation with ML with those from Heckman's two-stage method. The results from the sample selection model are more efficient than those from Heckman's two-stage method. That is, the coefficients are improved and the standard errors from the two-stage method with MLE are smaller than those from Heckman's two-stage method. Therefore, the sample selection model is preferred to both OLS and the Heckman's two-stage method for estimating demand.

Table 3. Model specifications for demand for health services

Variables	OP	VST Sel	VST Out
Age:			
0- 4	x	x	X
5-14	x	x	X
15-29 a)			
30-44	x	x	X
45-59	x	x	X
60 and over	x	x	x
Gender:			
Male a)			
Female	x	x	x
Household size			
Education:			
No School a)			
Elementary School	x	x	x
Middle School	x	x	x
High School	x	x	x
Technical College	x	x	x
University	x	x	x
Place of Residence:			
Large City	x	X	x
Middle City	x	X	x
Small (Eub) City	x	x	x
Rural (Myun) Area a)			
Health status:			
Bad Health a)			
Normal Health	x	x	x
Excellent Health	x	x	x
Health Insurance Premium	x	x	x
Outpatient Health Services:			
Out-of-pocket Costs	x	x	x
Travel Time	x	x	x
Waiting Time	x	x	x
Drugstore Health Services:			
Out-of-pocket Costs	x	x	x
Travel Time	x	x	x
Waiting Time	x	x	x
Health Insurance:			
Government	x	x	x
Industry	x	x	x
Region	x	x	x
Medical Aid	x	x	x
None a)			
Regular Source of Care:			
No a)			
Yes	x	x	
Estimation Method	Probit model	Two-stage method with MLE	

Note) Sel: selection equation ; Out: outcome equation; and a): reference group

IV. RESULTS

This section presents the results of the estimation of demand for outpatient health services. The two demand equations estimated the probability of outpatient health service use rather than no health service use (excluding drugstore only users); and the number of outpatient visits.

1. Descriptive Analysis

This section summarizes an univariate analyses of factors that affected the use of any outpatient health services rather than no health service use, and the number of outpatient visits. Table 4 shows the probability of outpatient health service use rather than no health service use excluding drugstore only users. Among the 35,951 individuals in the sample, 3,805 persons used an outpatient health system during the 15-day period. And it also summarizes mean and standard error of the number of outpatient visits by selected characteristics for the 3,805 outpatient users.

Children aged 0 to 4, who had the largest probability of outpatient health service use in the 15-day period, also averaged the largest number of visits. Gender differences were minimal with respect to total visits. A household size of two persons had the least outpatient visits. In spite of the highest probability of outpatient health service use, individuals living in a home where the head of the household had no schooling had the fewest outpatient visits. Despite no differences in the probability of outpatient health service use across places of residence, on the average residents living in a large city or middle city had higher outpatient visits than those living in a small city and rural

Table 4. The Probability of any outpatient health service use and mean and standard error of outpatient visits by selected characteristics.

Characteristic	Outpatient Users vs. Nonusers		Outpatient Visits		
	(N)	Prob.	(N)	Mean	S.E
Age: (p<0.000): 0- 4	2,679	.29	777	3.2	0.09
5-14	7,061	.08	555	2.6	0.09
15-29	9,933	.05	461	2.8	0.14
30-44	7,393	.09	630	2.9	0.12
45-59	5,672	.14	819	2.8	0.09
60 and over	3,213	.18	563	2.5	0.10
Gender: (p<0.000): Male	17,754	.10	1,744	2.9	0.06
Female	18,197	.11	2,061	2.8	0.06
Household Size: (p<0.000)					
1	864	.14	123	2.7	0.21
2	2,983	.13	390	2.5	0.13
3	5,611	.13	742	2.9	0.10
4	11,189	.11	1,223	2.9	0.07
5	7,951	.08	667	2.8	0.10
6 +	7,353	.09	660	2.7	0.11
Education: (p<0.000)					
No School	2,838	.13	360	2.6	0.12
Elementary School	8,428	.10	830	2.7	0.09
Middle School	6,963	.10	675	2.7	0.10
High School	11,703	.10	1,204	3.0	0.08
Technical College	833	.15	121	2.8	0.25
University	5,133	.12	608	3.0	0.11
Place of Residence: (p<0.055)					
Large City	14,654	.10	1,485	3.1	0.08
Middle City	7,925	.11	874	2.9	0.08
Small (Eub) City	4,457	.10	460	2.6	0.11
Rural (Myun) Area	8,915	.11	986	2.5	0.07
Health status: (p<0.000)					
Bad Health	2,038	.47	950	2.9	0.09
Normal Health	11,853	.24	2,834	2.7	0.05
Excellent Health	22,060	.001	21	1.5	0.24
Health Insurance Premium: (p<0.001)					
First Quartile	8,922	.12	1,032	2.5	0.07
Second Quartile	8,896	.10	928	2.9	0.09
Third Quartile	8,942	.10	896	2.9	0.09
Fourth Quartile	9,191	.10	949	3.0	0.09
Health Insurance Type: (p<0.000)					
Government	2,505	.12	309	2.9	0.15
Industry	12,636	.11	1,446	3.0	0.07
Region	16,321	.10	1,574	2.8	0.07
Medical Aid	2,724	.14	382	2.4	0.11
None	1,636	.05	75	2.5	0.28
Regular Source of Care: (p<0.000)					
No	25,471	.09	2,377	2.8	0.05
Yes	10,480	.14	1,428	2.9	0.07
Mean Probability/Mean visits	.12(mean prob.)		2.82(mean visits)		
Sample Cases	35,951		3,805		

area. Health status, as one would expect, positively correlated with the number of visits of outpatient health services like the probability of outpatient health services. Individuals with bad health status had a larger number of visits than others. The number of visits of outpatient health services generally rose with increases in the health insurance premium of the household. The fourth quartile of the health insurance premium showed the highest number of outpatient visits. While medical aid beneficiaries had the most outpatient health service use, their total visits was lowest. Persons with a regular source of care had a slightly larger number of outpatient visits than those with no regular source of care.

From the above results, it appears that though certain groups were less likely to use outpatient health service, once they did, their use patterns resembled the use patterns of those who had higher a probability of outpatient health service use, and vice versa. The mean number of outpatient visits during the 15-day period among outpatient health service users was 2.82, which can be converted to 69 visits per year. The expected outpatient visit per year for all people is 8.28 (=69 visits × 0.12(mean probability)), which is higher than 5.7 visits in 1987.

2. Outpatient Health Service Use

This demand equation estimates the probability of outpatient health service use rather than no health service use (excluding drugstore only users) during a 15 day period using a probit model and distinguishes outpatient health service users from nonusers. Table 5 shows the estimated results of the four alternative specifications for the demand equation OP. Model 1 uses only the demographic factors of age, sex, household size, education of household, and place of residence. For each set of variables, the null hypothesis is that the indicator variables are jointly equal to zero. The null hypothesis in each case can be rejected. In model 2, the health status factor is added to model 1 to determine the influence of the individual's health status. The log-likelihood ratio for model 1 and model 2 is extremely large (6,921.10 with 2 degree of freedom) so the health status is a very important factor in differentiating outpatient users from nonusers. Adding the health status factor decreased the effect of age, washed out the effect of sex, and household size, but increased the effects of education and place of residence. In model 3, adding the health insurance premium of household to model 2 contributed little. In model 4 (full model), price factors that include out-of-pocket costs, travel and waiting time, health insurance coverage, and regular source of care are added to determine the influence of those factors. The log-likelihood ratio due to the addition of these factors is modest (659.52 with 11 degree of freedom), so price-related factors are important in differentiating outpatient users from nonusers. However, these price-related variables had little effect on the variables in the model. Comparing the four models, it is clear that the coefficients of variables across models 2, 3, and 4 showed little change and are, in fact, remarkably stable. When the health status factor is added to model 1, the coefficients of several demographic variables changed as previously explained because health status accounts for much of the variation in those variables. Until now, we discussed each of the four models in a limited way. Results will now be discussed mainly in terms of the full model (model 4) in reference to the hypotheses of this study.

First, looking at the effects of age, those 0 to 14 were more likely to use outpatient health services while those 15 and over were less likely to use outpatient health services. In terms of the hypothesis, the variation among those 15 and older appears to be fully accounted for

Table 5. The estimated results of probit models of choice of outpatient health services rather than no health service use(excluding drugstore health service only users)

	Model 1		Model 2		Model 3		Model 4	
Variable	Coefficient	z-ratio	Coefficient	z-ratio	Coefficient	z-ratio	Coefficient	z-ratio
(Demographic Factor)								
Age:								
0~ 4	1.09100	30.92	1.2661	26.09	1.27615	26.24	1.29187	26.12
5~14	0.26772	8.20	0.41533	9.31	0.42018	9.41	0.43209	9.54
15~29 [a)]	-	-	-	-	-	-	-	-
30~44	0.28051	8.87	-0.010664	-0.26	-0.00772	-0.19	-0.02152	-0.52
45~59	0.60734	19.29	0.06033	1.48	0.05460	1.34	0.02412	0.58
60 and over	0.71628	19.62	0.08214	1.77	0.08117	1.74	0.02516	0.52
Gender:								
Male [a)]	-	-	-	-	-	-	-	-
Female	0.09188	4.78	-0.01317	-0.54	-0.01158	-0.47	-0.01113	-0.44
Household Size	-0.04394	-6.81	-0.01223	-1.51	-0.02289	-2.69	-0.02523	-2.88
Education:								
No School [a)]	-	-	-	-	-	-	-	-
Elementary School	-0.03783	-0.98	0.02677	0.57	0.02286	0.49	0.00825	0.17
Middle School	-0.03135	-0.77	0.09606	1.91	0.08245	1.63	0.07093	1.35
High School	-0.00949	-0.24	0.15324	3.15	0.12750	2.60	0.10964	2.14
Technical College	0.17038	2.54	0.42961	5.02	0.39803	4.63	0.37576	4.24
University	0.05302	1.21	0.27157	4.93	0.21612	3.81	0.18475	3.09
Place of Residence:								
Large City	-0.01386	-0.52	0.12831	3.80	0.10313	3.00	0.33539	3.85
Middle City	0.00788	0.27	0.13619	3.70	0.12006	3.24	0.31925	4.03
Small (Eub) City	-0.01719	-0.52	0.06465	1.55	0.06301	1.51	0.15556	2.39
Rural (Myun) Area [a)]	-	-			-	-	-	-

a): reference group
(Con’t)

Table 5 Continued

	Model 1		Model 2		Model 3		Model 4	
Variable	Coefficient	z-ratio	Coefficient	z-ratio	Coefficient	z-ratio	Coefficient	z-ratio
(Health status Factor)								
Health status:								
Bad [a)]			-	-	-	-	-	-
Normal			-0.87588	-25.09	-0.88287	-25.25	-0.81302	-22.29
Excellent			-3.42091	-43.61	-3.43204	-43.66	-3.38113	-41.55
(Economic Status Factor)								
Health Insurance Premium					0.00084	4.17	0.00077	3.50
(Price-related Factor)								
Outpatient Health Services:								
Out-of-pocket Costs							0.00042	1.39
Travel Time							0.02148	3.39
Waiting Time							0.006229	7.96
Drugstore Health Services:								
Out-of-pocket Costs							0.00312	1.20
Travel Time							-0.00098	-0.16
Waiting Time							0.02762	2.55
Health Insurance:								
Government							0.40883	4.70
Industry							0.38923	5.11
Region							0.35862	4.71
Medical Aid							0.50333	6.02
None [a)]							-	-
Regular Source of Care:								
No [a)]							-	-
Yes							0.14273	5.35
Constant	-1.58267	-32.37	-0.30634	-4.67	-0.28814	-4.38	-1.16639	-7.59
-2 Log-likelihood	20,685.56		13,764.46		13,747.38		13,087.86	
Log-likelihood ratio (LR)			LR(2,1)		LR(3,2)		LR(4,3)	
			6,921.10 (p<0.000)		17.08 (p<0.005)		659.52 (p<0.000	
Sample Cases	35,475		35,475		35,475		35,475	

by health status. The youngest age group is not necessarily unhealthy, but they need outpatient health services associated with usual childhood illnesses, injuries, vaccinations and pediatric checkups. The coefficient of household size was negatively related to the probability of outpatient health service use. This inverse association with household size can be explained as follows: first, the proportions of 45 and over in the case of household size 1 and 2 account for 51 percent and 57 percent of these groups so that they were more likely to need health service than the other age groups; and second, larger household size may be associated with lower income per capita, which itself may be associated with lower demand for health service. Education has a significantly positive effect on the probability of outpatient health service use. Unlike the hypothesis that education operates as an efficiency effect, that is, the effect of education is inversely related to the demand for health service under the assumption that price elasticity with respect to the demand for health is less than one, the education variable has a more significant knowledge effect rather than efficiency effect. Those with greater education may develop a taste for more health services.[12] Although the place of residence variable was not an important factor in differentiating outpatient users from nonusers in the univariate analysis, it emerged as a factor in the demand for outpatient health services. Rural (Myun) residents were less likely than other residents to use outpatient health services. The relationship between

12) Wagstaff (1986) explains the positive effect as follows: the better educated assign a lower marginal benefit to medical care consumption or enjoy a more favorable relationship with their physicians than the poorly educated. He also mentioned the difficulty of disentangling the effects of education from those of lifetime wealth on the demand for health service.

place of residence and the use of outpatient health services raises equity questions in the delivery of health services.

In terms of the underlying theoretical model, health status variables are expected to have an inverse relationship to demand for health service, because an individual is expected to increase his/her consumption of health care services when his/her actual stock of health capital falls short of his/her desired health stock. There are two-dummy variables for health status in this study: normal health status and excellent health status using bad health status as a reference group. These two dummy variables were significantly negative, as might be expected, that is, individuals with normal and excellent health status are far less likely to use outpatient health services relative to those with bad health status. This health status variable supports the derived demand theory that individuals are expected to increase the probability of using any health services when the actual stock of health decreases.

The health insurance premium of household as a proxy for income had an expected positive coefficient, unlike the negative effect observed in the univariate analysis. Outpatient out-of-pocket costs had no effect on the demand for outpatient health services. In general, it has been acknowledged that most people are insensitive to health care services because health care services are different from market goods, so they tend to do what they can do for improving their health if possible. Especially, when health service is covered by health insurance, people are less sensitive to the costs of medical care than if it is not covered. In Korea, since the initial introduction of the health insurance system in 1977, the uninsured were 43 percent of the population in 1987(Lee, 1987). After January 1988 (for farmers and fishermen) and July 1989 (for urban self-employees), these uninsured people have been covered by the national health insurance system. This means that they tried to meet their potential health needs because they felt reduced price effect so that their total out-of-pocket costs increased as previously mentioned. More importantly, the four types of health insurance have different years of enforcement. Government health insurance and Industry health insurance, which, together, account for 42 percent in this sample, have been provided for 10 years and 11 years, respectively; while regional health insurance, which accounts for 45 percent of this sample, have been provided for the past year. Therefore, beneficiaries of this health insurance may respond differently to medical prices. So, this demand equation for two sub-groups was estimated: one group with government and industry health insurance and the other group with regional health insurance. As expected, for the sub-group with government and industry health insurance, outpatient out-of-pocket costs had a significantly negative effect; while, for the sub-group with regional health insurance, outpatient out-of-pocket costs had a significantly positive effect on the demand for outpatient health services. This may be why outpatient out-of-pocket costs had no overall effect. Time variables, outpatient travel time and outpatient waiting time had positive effects on the demand for outpatient health services.[13)]

Looking at the cross-price and cross-time variables, the coefficients of drugstore out-of-pocket costs and travel time variables were insignificant. From these results, any inference about the relationship between outpatient and drugstore health services could not be made.

13) This may be explained as follows: it has been known that time variables such as travel time and waiting time are proxies for quality. That is, people expect to travel and wait longer for good health service.

Health insurance coverage was a very important factor in separating outpatient users from nonusers, with individuals with any health insurance coverage being more likely to use outpatient health services than those with no insurance coverage. Having health insurance coverage results in the reduction of price, leading to increases in the demand for health services. Also, having a regular source of medical care had a positive effect on outpatient health services.

3. The Number of Outpatient Health Service Visits

This demand equation estimates the number of outpatient visits conditional on outpatient health service use among all samples (not excluding drugstore only users) during the 15 day period. This demand equation (the outcome equation) is also estimated simultaneously along with a selection equation that estimates the probability that the individual had received outpatient health services during the 15-day period to correct for selection bias. Tables 6 shows the results of the four alternative models for an outcome equation[14)]estimated to assess the influence of demographic, health status, economic status, price-related factors and to examine the stability of our demand model. We are going to discuss the outcome equation which estimates the number of outpatient visits conditional on outpatient health service use based on the full model.

First, age affected the number of outpatient visits: only age groups 0-4 and 5-14 had significantly positive effects. The hypothesis that there is no relation between age and the demand for the number of

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14) The results of selection equation estimation are excluded in this paper because we are interested in the outcome equation .

outpatient visits is rejected. We previously discussed the reason for the significant effect of age groups 0-4 and 5-14. Household size was again significantly related to the number of outpatient health service as in the other demand equations, probably because household size 1 and household size 2 have more old people than the other household sizes. Education affected the number of outpatient visits, especially in those with technical college and university education. The hypothesis that education has negative effects on the number of outpatient visits is rejected. Education operated not as efficiency effects but as knowledge effect as explained previously. The place of residence was an important factor, which affected the number of outpatient visits: residents living in an urban big city or middle city had more outpatient visits compared to rural (Myun) residents. As in the probability of outpatient health service use, the relationship between place of residence and the number of outpatient visits reflects inequity problems in the delivery of health services. Health status had an inverse effect on the number of outpatient visits. We already discussed the hypothesis about health status in the first demand equation for probability of outpatient health service use so if will not be repeated again.

Outpatient out-of-pocket costs, outpatient travel time and outpatient-waiting time had negative effects on the number of outpatient visits, but only travel time was statistically significant. Separate estimations for the two subgroups (one group of government and industry health insurance; and the other of regional health insurance) did little to alter the relationship between the number of outpatient visits and outpatient price and time variables as in the first demand equation of the probability of outpatient health service use.[15] From these

15) As in the results of the first demand equation of the probability of outaptient healths service use, for one group (government and industrial health insurance beneficiaries) the outpatient out-of-pocket costs had a negative effect, though it was not significant; but for the other group (regional health insurance beneficianry), it had positive effects, though it was not significant.

results, we can say that individuals who already entered into the outpatient health service market were more responsive to travel time price and less responsive to outpatient out-of-pocket cost in 1989 just after the introduction of national health insurance system. But we do not know whether this kind of time effect existed before the introduction of the national health insurance system because we do not have data on before the national health insurance system was introduced. Estimated results of outpatient out-of-pocket price, travel time and waiting time elasticities are -0.00497, -0.06416, and -0.03553, respectively (see Table 7). The cross-price variable and drugstore out-of-pocket costs had a significant positive effect on the number of outpatient visits. From the results, we can infer that the relationship between outpatient health services and drugstore health services is substitutable in terms of drugstore out-of-pocket costs. Looking at the cross price and cross time elasticities, estimated results of drugstore out-of-pocket costs, travel time and waiting time elasticities are 0.01741, -0.05031, 0.00488, respectively. Health insurance coverage was significantly positive on the number of outpatient visits.

Table 6. The estimated results of the number of outpatient visits conditional on an outpatient health service use using a sample selection model

	Model 1		Model 2		Model 3		Model 4	
Variable	Coefficient	z-ratio	Coefficient	z-ratio	Coefficient	z-ratio	Coefficient	z-ratio
(Demographic Factor)								
Age:								
0~ 4	18.66216	14.58	4.01145	18.27	3.195715	21.61	3.49908	23.13
5~14	4.83030	7.49	1.02129	5.26	0.86552	5.87	1.10930	7.49
15~29 [a)]	-	-	-	-	-	-	-	-
30~44	5.23138	8.42	0.19960	1.16	0.15757	1.21	0.03412	0.27
45~59	9.80289	12.59	0.17096	1.00	0.14172	1.09	0.12922	1.00
60 and over	11.39556	12.44	0.10401	0.52	0.129001	0.84	0.20752	1.35
Gender:								
Male [a)]	-	-	-	-	-	-	-	-
Female	1.13115	3.21	-0.23990	-2.39	-0.16842	-2.22	-0.11371	-1.48
Household Size	-0.16324	-1.28	-0.02749	-0.81	-0.06883	-2.61	-0.11616	-4.39
Education:								
No School [a)]	-	-	-	-	-	-	-	-
Elementary School	-0.29133	-0.42	0.05055	0.26	-0.00790	-0.05	0.02114	0.14
Middle School	-0.45262	-0.62	0.03476	0.17	-0.03187	-0.20	0.07069	0.42
High School	-0.07532	-0.11	0.31158	1.54	0.15139	0.95	0.15425	0.94
Technical College	2.56596	2.13	0.92211	2.63	0.61599	2.36	0.64981	2.47
University	1.28992	1.62	0.76639	3.32	0.43364	2.40	0.40095	2.14
Place of Residence:								
Large City	0.48612	1.01	0.85309	6.01	0.57613	5.22	0.68346	5.40
Middle City	0.61473	1.18	0.59093	3.82	0.40043	3.32	0.65451	4.95
Small (Eub) City	-0.29274	-0.49	0.21052	1.17	0.15001	1.06	0.21606	1.52
Rural (Myun) Area [a)]	-	-	-	-	-	-	-	-
(Health status Factor)								
Health status:								

a): reference group; and b): This log-likelihood includes log-likelihoods from both the selection and the outcome equations (Con't)

Table 6: Continued

	Model 1		Model 2		Model 3		Model 4	
Variable	Coefficient	z-ratio	Coefficient	z-ratio	Coefficient	z-ratio	Coefficient	z-ratio
Bad Health [a]			-	-	-	-	-	-
Normal Health			-2.46441	-17.54	-1.89430	-18.49	-1.97813	-18.93
Excellent Health			-12.66460	-24.25	-9.41630	-19.71	-10.63791	-28.53
(Economic Status Factor)								
Health Insurance Premium					0.00425	6.95	0.00035	0.53
(Price-related Factor)								
Outpatient Health Services:								
Out-of-pocket Costs							-0.00115	-1.68
Travel Time							-0.00547	-1.96
Waiting Time							-0.00146	-0.73
Drugstore Health Services:								
Out-of-pocket Costs							0.01132	12.48
Travel Time							-0.00448	-0.91
Waiting Time							0.00619	0.99
Health Insurance:								
Government							1.50774	5.41
Industry							1.44203	5.75
Region							1.31158	5.22
Medical Aid							1.53624	5.44
None [a]							-	-
Regular Source of Care:								
No [a]								
Yes								
Constant	-39.15392	-22.91	-2.25393	-7.89	-0.77338	-3.53	-2.69764	-7.76
σ	18.78126	22.41	4.42717	94.24	3.31005	115.97	3.46236	107.00
ρ(disturbance correlation)	0.99839	1169.49	0.99813	924.93	0.97612	228.47	0.98682	426.59
-2 Log-likelihood [b]	41,619.94		35,321.70		35,304.62		33,821.92	
Log-likelihood ratio (LR)			LR(2,1)		LR(3,2)		LR(4,3)	
			6,298.24 ($p<0.00$)		17.08 ($p<0.005$)		1,482.70 ($p<0.00$)	
Number of Observation	3,805		3,805		3,805		3,805	

Table 7. Elasticity for outpatient health services

Demand Equation	Outpatient Health Service	Number of Outpatient Visit
	Elasticity or Change in Probability[1)]	Elasticity or Change in Visits[2)]
Age: 0- 4	0.02791	0.25817
5-14	0.00934	0.04005
15-29 [a)]	-	-
30-44	-0.00046	0.01135
45-59	0.00052	0.01116
60 and over	0.00054	0.00610
Gender: Male [a)]	-	-
Female	-0.00024	-0.04290
Household Size	-0.02523	-0.08514
Education: No School [a)]	-	-
Elementary School	0.00018	0.00253
Middle School	0.00153	0.00313
High School	0.00237	0.01528
Technical College	0.00812	0.00629
University	0.00399	0.02039
Place of Residence:		
Large City	0.00725	0.10658
Middle City	0.00690	0.04320
Small (Eub) City	0.00336	0.00434
Rural (Myun) Area [a)]	-	-
Health Status: Bad [a)]	-	-
Normal	-0.01757	-0.59883
Excellent	-0.07306	-0.02154
Health Insurance Premium	0.01397	0.06622
Outpatient Health Services:		
Out-of-pocket Costs	0.00329	-0.00497
Travel Time	0.05157	-0.06416
Waiting Time	0.01923	-0.03553
Drugstore Health Services:		
Out-of-pocket Costs	-0.01994	0.01741
Travel Time	-0.00198	-0.05031
Waiting Time	0.01002	0.00488
Health Insurance:		
Government	0.00883	0.04424
Industry	0.00841	0.19260
Region	0.00775	0.18104
Medical Aid	0.01088	0.04656
None [a)]	-	-
Regular Source of Care		
no [a)]	-	
Yes	0.00308	

1) For continuous variables, these values are elasticities using marginal effects that are computed at the means of the Xs. For dummy variables these values are approximate changes in probability when the dummy variable changes from 0 to 1.
2) These values are elasticities for continuous variables but they are changes in number of visits or costs for the dummy variables. Note) a: reference group

V. CONCLUSIONS

When individuals have health insurance coverage, their out-of-pocket costs for medical care will decrease, but their time costs become more critical because health insurance does not cover time costs. That is, the introduction of the health insurance system makes individuals more responsive to time costs and less responsive to out-of-pocket costs. This study supports the above theory in the demand equation for outpatient visits given an outpatient health service use. According to the results of this study, the national health insurance system in Korea can be graded as successful in terms of realization of potential demand for outpatient health services that individuals had but could not satisfy because of barriers of out-of-pocket costs of outpatient health services. And also, from the above results, we can suggest the following policy implications. First, the significant effect of travel time on the demand for outpatient health service visits given an outpatient health service use suggests a policy instrument for delivering more services to target groups by improving transportation, or locating clinics closer. In particular, residents living in rural areas where distribution of health service resources have been more restrictive have a longer travel time and waiting time for using outpatient health services than urban dwellers, which might prevent rural residents from using outpatient health services. Thus, health care facilities and health personnel should be expanded or redistributed to rural areas. Besides the above health policies, Grossman's model, on which this study is based, is important from a policy point of view because health service is one of the inputs to produce health. Besides health services, there are other factors that affect health, such as environmental, occupational, and life-style. Public policy should also be designed to reduce the effects of factors that are detrimental to human and enhance the influence of those that are beneficial to health status.

There are a number of limitations of the data and the measures used. Some of these limitations are the result of using secondary data, e.g., the selection of sampling units and the selection of survey period are given, and some of the variables such as price and income are indirectly measured. First, the sampling unit of the data used for this study is the family, and not the individual. However, the unit of analysis for this study is the person. In the case of this study, there may be a problem of data dependency. For instance, if one of the family members is ill from a communicable disease, other family members are more likely to become ill. Also, family members are assigned the same value for some variables, e.g., health insurance premium of the household, education of the household head, and place of residence. In order to solve this kind of problem, there are two approaches: first, to randomly select one family member per family, or second, to use a variance component two-stage probit. The use of the former leads to reduction of sample size and increases in sampling errors. The latter alternative is currently not available. Therefore, the estimators from this study might be slightly underestimated. Second, the individual's health status is a key construct in the theoretical model of this study. That is, the adequate measurement of health is crucial if a researcher wants to understand why some individuals demand more health services than others do. Even though we used a health status index as initial health stock, this measure might reflect the health status after, rather than before the health services had been utilized, and then consequently confound the analysis. Finally, this health service utilization data has a limited observational range. Consequently, the number of individuals hospitalized during this 15-day period is very small. If the period of observation were longer, the increase in number of inpatients would have allowed an analysis of the relationship between outpatient and hospital inpatient health services, and we could also obtain more consistent and incisive results of demand for health services.

REFERENCES

Acton, J. P., "Demand for Health Care Among the Urban Poor, With Special Emphasis on the Role of Time", In R.N. Rosett (Eds.), *Role of Health Insurance in the Health Services Sector(*pp.165-208). New York: National Bureau of Economic Research, 1976.

Anderson, R., "Health Status Indices and Access to Medical Care", *Amer.ican Journal Public Health.* Vol.68, 1978. pp.458-469.

Becker, Gary S., "A Theory of the Allocation of Time", *Economic Journal*, Vol.75, 1965. pp.493-517.

Borjas, G. J., "The Relationship Between Wages and Weekly Hours of Work: The Role of Division Bisa", *The Journal of Human Resources*, Vol.xv, No.3, 1980. pp.409-423.

Chesher, A. and Irish, M., "Residual Analysis in the Grouped and Censored Normal Linear Model", *Journal of Econometrics*, Vol.34, 1987, pp.33-61.

Coffey, R. M., "The Effect of Time Price on the Demand for Medical Care Services", *Journal of Human Resources*, Vol. 18(3), 1983, pp.407-424.

Cragg, J. G., "Some Statistical Models for Limited Dependent Variables with Application to the Demand for Durable Goods", *Econometrica* Vol.39, 1971, pp.829-844.

Duan, N., Manning, W. G., Morris, C. N. and Newhouse, J. P., *A Comparison of Alternative Models for the Demand for Medical Care,* The RAND Corporation, R-2754-HHS, 1982.

Feldstein, M. and Fridman, B., "The Effect of National Health Insurance on the Price and Quantity of Medical Care", In R.N. Rosett (Eds.), *Role of Health Insurance in the Health Service Sector*, 1976, pp.505-539.

Green, W., "Sample Selection Bias as a Specification Error: Comment", *Econometrica*, Vol.49, 1981, pp.795-798.

Grossman M., *The Demand for Health: A Theoretical and EmpiricalInvestigation,* Columbia University Press, New York, 1972.

Heckman, J., "The Common Structural of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for Such Models", *Annuals of Economic and Social Measurement*, Vol.5, 1976, pp.475-492.

Heller, P. S., "A Model of the Demand for Medical and Health Services in Peninsular Malaysia", *Social Science & Medicine*, Vol.16, 1982, pp.267-284.

Joreskog, K. G., "A General Method for Analysis of Covariance Structures", In D. J. Aigner & A.S. Goldberger (Eds.), In *LatentVariables in Socioeconomic-Models,* Amsterdam:North-Holland, 1977, pp.187-204.

Kwon, S. W., *Demand for Medical Care among the Rural Poor in Korea: An Empirical Investigation Using Survey Data*. University Microfilms International, 1984.

Lancaster, K. J., "A New Approach to Consumer Theory", *Journal of Political Economy*, Vol.75, 1966, pp.132-157.

Lee, K., "Medical Security System. In Korea Institute for Population and Health", *Health Service Resources and Management System,* Workshop paper, 1987, pp.237-252.

Maddala, G. S., *Limited-Dependent and Qualitative Variables in Econometrics,* Cambridge University Press, 1983.

Maddala, G. S., "A Survey of the Literature on Selectivity Bias as It Pertains to Health Care Markets", *Advances in Health Economics and Health Services Research,* Vol.6, 1985, pp.3-18.

Manning, W. G., Newhouse, J. P., Duan, N., Keeler, E. B., Leibowitz, A. and Marquis, M. S., "Health Insurance and the Demand for Medical Care: Evidence from a Randomized Experiment", *The American Economic Review*, Vol.77(3), 1988, pp.251-277.

Min, J. S., *The Concepts and Basic Philosophy of Health InsuranceDuring Period of 7 years-in Terms of Economic Perspectives,* Seoul, Korea: National Federation of Medical Insurance (in Korean), 1984.

Moon, O., Park, S., Lee, J., Cho, H., Rho, W. & Woo, Y. *Korean Medical Insurance,* Seoul, Korea: Shinkwang Publications(in Korean), 1990.

Moon, O. R. "Health Care System in Korea", In L. H. Kwon & Y. O. An (Eds.), *The Past and Today of Health of Korean,* Seoul, Korea: College of Medicine, Seoul National University, (In Korean), 1980.

Moon, O. R., *The National Health Insurance Policy in Korea,* Seoul, Korea: School of Public Health, Seoul National University (in Korean), 1987.

Muller, C. "Review of Twenty Years of Research on Medical Care Utilization", *Health Services Research*, Vol.21(2), 1986, pp.129-144.

Muth, R., "Household Production and Consumer Demand Functions", *Econometrica*, Vol.34, 1966, pp.699-708.

Muuriene, J. M., "Demand for Health: A Generalised Grossman Model", *J. of Health Economics*, Vol.1, 1982, pp.5-28.

National Federation of Medical Insurance, *1989 Medical Insurance Statistical Yearbook,* Seoul, Korea, 1990.

Nelson, F. D., "Efficiency of the Two-Step Estimator for Models with Endogenous Sample Selection", *Journal of Econometrics*, Vol.24, 1984, pp.181-196.

Newhouse, J. P., "The Demand for Medical Services: A Retrospect and Prospect", In J. van der Gaag & M. Perlman (Eds.), *Health Economics, and Health Economics,* North-Holland Publishing Company, 1981, pp.85-101.

Noh, K. K., *A study on price elasticities of medical care services,* Seoul, Korea: Korea Institute for Population & Health (In Korean), 1985.

Pauly, M. V. & Langwell, K. M., "Research on Competition in the Market for Health Services: Problems and Prospects", *Inquiry*, Vol.20, 1983, pp.142-161.

Phelps, C. E., *Health Economics,* Harper Collins Publishers, 1992.

Phelps, C. E. and Newhouse, J. P., *Coinsurance and the demand for medical services,* The Rand Corporation, 1974.

Suh, S. & Yeon, H, *Social Welfare During the Structural Adjustment Period in Korea,* Korea Development Institute: Working paper 86-04. 1986.

Taube, C. A., Kessler, L. G. and Burns, B. J., "Estimating the Probability and Level of Ambulatory Mental Health Services Use", *Health Services Research*, Vol.21(2), 1986, pp.321-339.

Tobin, J., "Estimation of Relationships for Limited Dependent Variables", *Econometrica*, Vol.26, 1958, pp.24-36.

Van De Ven, W. & Van Der Gaag, J., "Health as an Unobservable: A MIMIC-Model of Demand for Health Care", *Journal of Health Economics*, Vol.1, 1982, pp.157-183.

Wagstaff, A., "The Demand for Health", *Journal of Health Economics*, Vol.5, 1986, pp.195-233.

Wagstaff, A., "Econometric Studies in Health Economics", *Journal of Health Economics*, Vol.8, 1989, pp.1-15.

Yang, B. M., "Payment-Reimbursement System", In KIPH, *Health Resources and Management System* (in Korean), Seoul, Korea, 1988.

Yang, B. M., *Health Economics,* Seoul, Korea: Sumusa (in Korean), 1989

요약

우리나라의 외래의료수요

오 영호

이 연구는 1989년 전국건강설문조사자료를 사용하여 Grossman 이 제안한 이론적인 모델에 근거하여 다음 질문에 답한다: 전국민의료보험시행이후 우리나라의 의료수요는 어떠한가? 이 연구에서는 의료이용측도로 외래의료이용여부와 외래의료이용횟수를 사용하였다. 첫 번째 외래의료수요모델인 외래의료이용여부방정식은 probit model 을 사용하였다. 그리고 나머지 의료수요방정식에서 종속변수인 외래의료방문횟수는 절단(censored)되었는데, 이는 주로 관측이 안되었다기보다는 선택문제(selection problem)가 있다. 이러한 수요방정식을 추정하기 위해서는 먼저 개인의 의료이용결정을 방정식화해서 함께 추정해야 하는데, MLE (Maximum Likelihood Estimator)를 이용한 2단계 추정법 (Two-stage method with MLE)을 사용하였다.

본 연구 결과의 정책적인 함의는 첫째,외래의료이용자의 의료이용량인 방문횟수 측면에서 의료보험적용으로 경제적인 부담은 줄어들었지만, 반면 상대적으로 시간비용에 대한 부담이 커져 의료이용을 하는데 소요되는 시간이 중요한 요인으로 등장하였다. 따라서 의료취약지역에 대한 교통수단을 용이하게 하고, 의료취약지역에 의료시설을 신설하며, 대기시간을 줄일 수 있는 예약제도를 활성화할 수 있도록 해야한다. 둘째, 소득이 여전히 외래의료시장진입에 영향을 미치고 있어 이러한 경제적인 영향을 줄이기 위한 방안을 고려하여야 한다.