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**The Effect of Economic Factors on Patient's
Choice of Medical Providers: A Case Study in Rural China**

Abstract: *The Patient's behavior of seeking medical service have changed since last ten years. This study examines the effect of economic factors, including income, health insurance, and employment status, on patient's behavior. four types of medical services are identified: self-treatment, village health post, township health center, and county hospital and above services. The model is estimated using a multinomial logit approach applied to a sample of 1877 cases of first use of medical service from Shunyi county household survey in 1993. The results suggest that both income effect which represented by income and employment status, and price effect which represented by insurance status have the effect on driving patient using more health services at vilallage or county level instead of township level . The results also reveal that the health status and other demographic characteristics are also have the influence on patient choice behavior. The finding provide essential information for making health policies of reestablish CMS and health resource allocation in rural China.*

I. Introduction

The patient's choice of medical providers, as well as economic situation and health care system, has changed in rural China during the past decade. The annual visits to county hospitals and

above increased from 1.138 billion in 1982 to 1.439 billion in 1992, increased 26.4% within ten years, while the figure for township clinics decreased from 1.419 billion in 1982 to 1.034 billion in 1992, decreased 27.1% within ten years.^{1,2}

One of the most common explanation is the increases of demand for higher-quality medical care. Demand for medical care is directly related to income. Agricultural reforms in China prompted rapid economic development and income increase of rural population. In the prosperous communities, despite the availability of rural doctor in village level, many people went directly to county hospital for medical services. People were willing to pay higher out-of-pocket costs to obtain what they believe is better services from more qualified medical staff.³

Besides the income, several other economic factors also have the potential effect on patient's choice. The most interested for the policy maker is the insurance effect. Following the agricultural reforms in the early 1980's, most cooperative medical system(CMS) which was considered the major health insurance scheme in rural China collapsed.⁴ The vast majority of the rural population obtain their medical services on the fee for service(FFS) basis rather than the previous prepaid basis. At same time, the three tier referral system from village health post to township health center and from township health center to county hospital was also disappeared. Under FFS system, people have a freedom of choice to use any level of medical services rather than go to village health post as initial contact with medical providers. On the other hand, most of remaining or newly reestablished CMS usually only cover the medical expenditure spent within their own village health post, which could lead patient's use more village services rather than other's.

The employment status is another important factor which reflect the people's ability to pay for medical service. One of major causes of rapid economic increase in rural China is development of township enterprises. Many farmers became workers working in the township enterprises and get cash salary from those firms, which implies their disposable income could be higher even their total income is same as the farmer's. Their ability to pay for medical services would be higher than farmer's subsequently.

A better understanding of what leads individuals to seek medical service for health problems and what determine their choice of provider is important for several reason. First, patient's medical service utilization pattern is directly related to the allocation of health resources. Current three tier network of health provider system in rural China was built under the central planning system. The health resources allocation from government is based on the scale of each health institute such as quantity of personnel and patient's bed. Since market system and decentralization administration approach have been introduced into health care sector in China, people began to think and use market mechanism to allocate health resource, which implies to allocate health resources based on the patient's demands for medical service rather than based on the scale of health institutes. Exploring what factors influence patient's choice of different medical providers is very helpful for understanding the patient's demand of medical services, which will help decision makers making better health policies on health rescues allocation.

Second reason to examine patient medical seeking behavior is that patient's choice of different medical providers is related to the cost-effectiveness of health care system. Chinese

government has already announced that China will reestablish cooperative medical system in near future.⁵ Newly developed CMS could influence patient's choice as well as cost-effectiveness of health care resource utilization. Understanding of what key factors influence people's medical service seeking behavior and how they influence are very helpful for the designing of future's CMS to reach the object of using health care resources cost-effectively.

The following sections of this paper will using multinomial logit model to explain the effect of economic factors on people's medical service seeking behavior. A brief overview of the multinomial logit model as well as estimation procedures for determining factors that influence the patient's choice of provider appears in the next section. The third section presents the data used in this study. Subsequently, we presents the result of the empirical analysis. the final section provides some brief concluding remarks.

II. Methodology

The patient's choice of medical providers is a discrete decision, which is consistent with "qualitative choice models". In this qualitative choice situation, we presume that an individual can choose among four alternatives: to seek self-treatment; to seek medical service from individual village doctors, which include rural doctors working in village health post and solo private practitioner; to seek medical service from township health center; or to seek medical service from county hospital or above.

In choosing to obtain medical services from whom, individuals consider a variety of characteristics of the alternative providers, such as proximity and quality. The decision is also

affected by the characteristics of patients themselves, such as insurance coverage, income, individual's health status, education, age, gender, and so on. We can elaborate upon this general descriptive with concepts from the standard microeconomics theory of utility maximization. The utility for choosing each medical provider depends on a set of observed characteristics of: (1) the provider, (2) individual economic status, (3) individual health status, and (4) other individual's characteristics. We differentiate individual characteristics from characteristics of economic status and health status in order to allow individuals to make different utility-maximizing selections as the particularities of the economic status and health problem varies.

An individual chooses among alternatives based on the utility of each alternative. More specifically, we can follow McFadden⁶ to posit that the utility of choice option j to individual i , U_{ij} is:

$$U_{ij} = V_{ij}(M_j, H_i, E_i, C_i) + \varepsilon_{ij} \quad (1)$$

$V(M, H, E, C)$ represents utility determined by observed data.

M is a vector of provider characteristics.

H is a vector of individual health status.

E is a vector of individual economic status.

C is a vector of other individual characteristics.

ε is a vector of unobserved components.

j denotes provider choice alternatives (0=self-treatment, 1=village level, 2=township level, 3=county and above) component, which will be treated as a random variable.

Utility-maximizing behavior implies that an individual i will only choose a particular alternative j if $U_{ij} > U_{ik}$ for all k not

equal to j . Because ε is assumed to be a random variable. the situation if $U_{ij} > U_{ik}$ is also random. The probability of any given alternative j being chosen by an individual can be expressed as:

$$P = P(U_{ij} > U_{ik}) \text{ for all } k \neq j \quad (2)$$

By substitution of (1),

$$P = P(V_{ij} + \varepsilon_{ij} > V_{ik} + \varepsilon_{ik}, \text{ for all } k \neq j)$$

Rearranging,

$$P = P[(\varepsilon_{ik} - \varepsilon_{ij}) > (V_{ij} - V_{ik}), \text{ for all } k \neq j] \quad (3)$$

By knowing the distribution of the random ε 's (though not knowing their particular values), we can derive the distribution of each difference $\varepsilon_{ij} - \varepsilon_{ik}$ for all $j, j \neq k$, and by using equation (3) Calculate the probability that the patient will choose alternative j .

Letting $X_{ij} = (M_j, H_i, E_i, C_i)$ and assuming $V(\cdot)$ to be a linear function of components of X , we operationalize Equation 2 as:

$$U_{ij} = \beta_j X_{ij} + \varepsilon_{ij} \quad (4)$$

where β_j is a vector of coefficient values indicating the effect of the various X_{ij} 's on individual i 's utility for option j . Note that β_j is subscript by the choice index j . This means that in our analysis a given X_{ij} is allowed to "interact" with each choice option. For example, age may have one effect on the utility of treatment in village post and another effect on the utility of treatment in the township center.

The most widely used qualitative choice model is logit.⁷ Since the patient's alternative choices are more than two, we adopted multinomial logit model (MNL) in this study. Assume that each ε_{ij} for all alternative j is distributed independently, identically in accordance with the extreme value distribution. Given this

distribution for the unobserved components of utility, the probability that the patients will choose alternative j is

$$\text{Prob}(\text{Option } j | \mathbf{x}_{ij}) = \frac{\exp(\beta_j X_{ij})}{\sum_{k=1}^4 \exp(\beta_k X_{ik})} \quad (5)$$

The parameters of this model can be estimated straightforwardly using maximum-likelihood methods.

The MNL model is often associated with the "independence of irrelevant alternatives" assumption. But this assumption is not realistic in many situations. Recent work has indicated that this assumption in logit models is not as restrictive as it first seems.⁸ In this application, since all right-hand-side variables are individual characteristics, nesting of models produces the same results as a non-nested model.⁹

III. Data and variables

The data used in this study is from a household interview survey which was done by Beijing Medical University in Shunyi county during the summer of 1992 and spring of 1993. Shunyi county is located in the east suburb of Beijing. There are about 530,000 population in this county. The Rural Total Product of Society of Shunyi county was ranked at 39 in whole 2240 counties in rural China,¹⁰ which means that our sample represents relative rich rural population in China.

The stratified method based on the economic development was adopted for the sampling in order that the sample could represent the whole county's status. The whole sample was split into four sets, and the households within each set were interviewed in four different seasons. The whole data base includes 2244 households with 8853 individuals from 6 villages sampled.

At the core of this data base is the two weeks medical service utilization survey. The individuals were asked whether they used any kind of medical services (or treatment) or not within last two weeks from the survey. The sample used for MNL analysis includes 1877 cases of first use of medical service (or treatment) within last two weeks, which were reported by 8853 interviewed individuals. Among these utilization, 413 cases (22% of 1877) were self treatment, which mainly were self drug treatment. 985 cases (52.21) were village health post visit. 242 cases (12.89%) were township health center visit. 242 cases (12.89%) were county hospital and above visit. Compared with utilization pattern in 1987, which was presented in table 1, the change of patient's choice of medical services is consistent with national statistic data's.

Table 1. Patient's Choice of Medical Providers by Different Year in Shunyi County

Provider	1993		1987 ¹¹	
	Number	%	Number	%
Village Health Post	980	67.0	2296	60.7
Township Health Center	242	16.5	937	24.8
County Hospital and Above	242	16.5	552	14.6
Total	1464	100.0	3785	100.0

The economic characteristics of individuals were also collected in this survey. First, people are classified into three groups based on health insurance status, which reflect the price of health service. Insured people include government employees who are covered by the Government Health Insurance (GHI), and state-owned enterprise's employees who are covered by the Labor Health Insurance (LHI). For those people above, their health expenditure can be reimbursed (mostly) by insurance schemes. CMS groups of people are covered by newly reestablished CMS, which only cover medical expenditure spent within their own village health post. The rest of people are on the FFS scheme.

The second economic characteristics of individual is income, which reflect ability to pay for health service. We created two dummy variables to represent the low income group (about 22% of 1877), middle income group (60%), and high income group (about 18%).

Besides income, employment status also captures part of economic factors which could influence people's ability to pay for medical services. For farmers, part of their income can not be cashed. Their disposable income, which can be spent for their medical service, usually is lower than their total income. For workers, on the other hand, their income are all disposable income. Even their total income are same as farmers', their ability to pay for health service could be higher than farmers.

This survey also collected information on a variety of social, demographic characteristics as well as health status of individuals. This information included: age, gender, marital status, and education status. There are two sets of variables reflect health status of individuals. One is the chronic disease history. Another is disease pattern which include 10 dummy

variables to represent top ten most frequent causes of medical service utilization. ICD-9 was adopted to classify diseases.

One dichotomous variable is included for the measurement of distance from household to health institutes. Since every village have their own village health post and all six villages sampled have almost same distances from village to county hospital, This variables only capture the distance difference from households to their own township health centers. The names of all independent variables used in MNL model, short definitions and descriptive statistics appear in table 2.

Table 2. Variable Descriptions

Variables	Description	Mean (Std. Dev.)
Lincome	1 if income<=700; 0 otherwise	.22 (.42)
Hincome	1 if income>1600; 0 otherwise	.17 (.38)
Farmer	1 if farmer; 0 otherwise	.22 (.41)
Nfarmer	1 if worker or other salary paied staff; 0 otherwise	.25 (.43)
Ins	1 if covered by GHI or LHI; 0 otherwise	.07 (.26)
CMS	1 if covered by CMS; 0 otherwise	.39 (.49)
Dari	1 if Acute respiratory disease; 0 otherwise	.46 (.50)
Dosi	1 if Oesphagus, stomach, and Intestine disease; 0 otherwise	.09 (.29)
Dht	1 if Heart disease; 0 otherwise	.06 (.24)
Dhyper	1 if Hypertension; 0 otherwise	.05 (.21)
Dij	1 if Injury; 0 otherwise	.03 (.18)
Dcop	1 if Chronic, Obstructive, and Pulmonary disease; 0 otherwise	.04 (.19)
Dms	1 if Musculo-Skeletal disease; 0 otherwise	.04 (.19)
Dor	1 if Oral disease; 0 otherwise	.02

		(.14)
Dinfec	1 if Infectious & Parasitic disease; 0 otherwise	.03 (.16)
Dment1	1 if Mental Health Problem; 0 otherwise	.02 (.14)
Chron	1 if having chronic disease history; 0 otherwise	.46 (.50)
Age0	1 if age <= 14 years old; 0 otherwise	.22 (.41)
Age60	1 if age > 60 years old; 0 otherwise	.19 (.39)
Male	1 if male; 0 otherwise	.43 (.50)
Unmar	1 if unmarried; 0 otherwise	.35 (.48)
Illi	1 if illiteracy; 0 otherwise	.26 (.44)
Elem	1 if elementary education; 0 otherwise	.26 (.44)
Prim	1 if primary education and above; 0 otherwise	.34 (.48)
Summer	1 if survey conducted in summer; 0 otherwise	.24 (.43)
Autumn	1 if survey conducted in Autumn; 0 otherwise	.20 (.40)
Winter	1 if survey conducted in Winter; 0 otherwise	.34 (.48)
Neart	1 if household near township health center; 0 otherwise	.29 (.45)

IV. Multinomial logit estimation.

The estimates of the multinomial logit model are presented in table 3. The column on the far left gives the independent variable labels. The other columns give the coefficients and relative risk ratios (RRR) for village health post relative to self-treatment, township health center relative to self-treatment, and county hospital relative to self-treatment, respectively. The estimated coefficients can be used to generate predicted probability of each individual choice for different medical providers. Of the actual village health post users, we

correctly predict 72.0% of their uses; of the actual township health center users, we correctly predict 72.7% of their uses; of the actual county hospital users, we correctly predict 72.3% of their uses; and of the self-treatment users, we correctly predict 75.3% of their uses. The overall correct prediction rate for the multinomial logit model across the four choices is 72.9%.

Because the multinomial logit results normalize the coefficients for the self-treatment category to zero, the estimated coefficient for the three treatment models can be viewed as the effect of a particular variable on the probability that a given treatment mode will be chosen relative to the probability of self-treatment. Therefore, the differences between estimated coefficients for a specific variable across equations indicate the effect of that variable on the probability that one treatment mode will be chosen over another.¹²

Our discussion of the coefficient estimates is divided into two parts: a presentation of the economic characteristic results, and a discussion of the social and demographic results.

The coefficient estimate for the insurance variable indicate that insurance (include GHI and LHI) leads to increase probabilities of use higher level of health services. The RRR (which resemble odds ratio) for insurance in village health post, township health center, and county hospital equations are 0.58, 1.09, and 1.39 respectively. This implies, controlling other variables, that insurance recipients are 0.42 times less likely to receive medical service from village health post than similar individuals on FFS scheme. Similarly, insurance makes almost no different on the probability of using township health center service between insured group and FFS group. But the insurance does increase the chances, by a factor of 1.39, of receiving medical services from county hospital and above. The results

suggest that insurance enrollment increases the likelihood that a user of health service will choose a county hospital over a village health post service modality by a factor of 2.40, and over a township center service modality by a factor of 1.28. Reversing the results of insurance group, The RRR for CMS group in village health post, township health center, and county hospital equations are 2.31, 1.11, and 0.89; which implies CMS people are 1.31 and 3 times more likely to use village health post service than FFS and insurance groups respectively, and less likely to use county hospital service than insurance group. These results are consistent with a price response in a decision about whether or not to use services.

The results for income and occupation variables also consistent with the expected pattern of health service utilization. The income variable estimate that, controlling other factors, higher income group are in general more likely to use higher level of health services than lower income group. For example, the odds ratio of income variables mean that, on the one hand, higher income group are 5% and 30% less likely use village health post services than middle and low income group respectively. On the other hand, higher income group are 25% and 10% more likely use county hospital and above services. Higher income group and middle income group have similar probabilities to use township health center services, and they both are 47% less likely to receive township health services than lower income group. The results from occupation variables are almost same as income's. That is the non farmer group tend to use less village health post and township health center services, and use more county hospital and above services than farmer group.

The results of disease variables suggests that for most of disease, patient's choice follows conventional pattern. The

likelihood of utilization decrease as the level of provider goes up. But there are several exceptions. For example, based on our results of RRR, patients with heart disease, hypertension, or injury are more likely to use hospital services rather than township health center's. Chronic disease history is another health status variable which reflect the people's need of health services. The estimate for this variable indicates a significantly positive effect on the probability of using higher level health services. people who has chronic disease history increases the chance, by a factor of 1.61, of receiving health services from county hospital and above services than people who has not chronic disease history, and is 56% more likely to use county hospital and above services than township's.

Besides economic characteristics, age and education are other variables which have potential explanatory power on the change of patient's choice pattern. The estimate for the aged group indicates a constant negative effect on the probability of any use of health services, which implies that old people are more likely to use self-treatment than young people. The results of education variable suggest controlling for other factors constant, higher education group of people are more likely to use county hospital and above services than lower education people.

One of puzzling result of this study is come from distance variable estimation. It was expected that the people who live near township health center will be more likely to use township health center services, the probability of use village health post and county hospital services would decrease subsequently. The results of our study indicate the patient who live near township center are 56% less likely to use county hospital services than the patient who live far from township health center, which is consistent with expectation. But patients who

live near township are only 9% more likely to use township center services than the other patients. Reversed expectation, the patients lived near township center are 31% more likely to use village post service than other patients. The explanation of this utilization pattern still need to be explored.

Within three season variables, the most significant is autumn one. The RRR of it on county hospital and above equation is 2.33, which is 2, 5, and 7 times bigger than the spring, summer, and winter's odds ratios, which means during autumn the patients are much more likely to receive medical services from county hospital and above than other three seasons. One of possible economic explanation is that autumn is the harvest season in rural area and farmer usually have more disposable income, which implies their ability to pay and demand for higher quality of health service might be higher than other seasons. Another potential reason could be that, due to heavy farm work in the autumn, people suffer more severe disease than the rest of other seasons. Unfortunately, we can not make clear explanation from this study.

Table 3. Multinomial Logit Results

Variables	Village Post		Township Center		County Hospital	
	Coef.	RRR	Coef.	RRR	Coef.	RRR
Lincome	.29*	1.33	.39*	1.48	.13	1.14
Hincome	-.05	.95	.01	1.01	.23	1.25
Farmer	.22	1.25	.20	1.22	.22	1.25
Nfarmer	-.19	.83	.02	1.02	.28	1.32
Ins	-.55**	.58	.09	1.09	.33	1.39
CMS	.84**	2.31	.11	1.11	-.11	.89
Dari	.81***	2.24	-.75***	.47	-1.56***	.21
Dosi	-.25	.78	-.56*	.57	-1.16***	.31
Dht	-.49	.62	-.71*	.49	-.35	.71
Dhyper	-.13	.87	-1.30***	.27	-1.19***	.31
Dij	.44	1.55	-.02	.98	.02	1.02
Dcop	-.10	.91	-.69	.50	-2.01***	.13
Dms	-.81**	.44	-.41	.66	-1.29***	.27

Dor	.89*	2.44	.36	1.43	-.29	.75
Dinfec	.85	2.35	1.35**	3.85	1.13*	3.10
Dmentl	-.46	.63	-.15	.86	-.22	.80
Chron	-.14	.87	.03	1.03	.48**	1.61
Age0	.39	1.48	-.46	.63	.69	2.00
Age60	-.21	.81	-.85***	.43	-.46*	.63
Male	.14	1.15	-.08	.92	.10	1.10
Unmar	-.20	.82	.17	1.18	-.04	.96
Illi	-.68*	.51	-.95*	.39	-.27	.76
Elem	-.43	.65	-.58	.56	.04	1.04
Prim	-.37	.67	-.92*	.40	.25	1.29
Summer	-.55	.58	-.37	.69	-1.14**	.32
Autumn	-.67**	.51	.01	1.01	.85*	2.33
Winter	-.25	.78	-1.50**	.22*	-.78*	.46
Neart	.27	1.31	.08	1.09	-.83**	.44
Cons	1.01*		1.24*		.38	

Outcome level=0, the FFS group is the comparison group

*: P<=0.10; **: P<= 0.05; ***: p<=0.01

Number of obs = 1877

chi2(84) = 629.07

Prob > chi2 = 0.0000

Log Likelihood = -1939.0922

Pseudo R2 = 0.1396

V. Conclusion and Discussion

The analysis clearly shows that economic characteristics, as well as health status and other demographic characteristics of individuals, have the effect on the patient's choice of different medical providers. Their aggregate effect can be used to explain the current change of patient's choice behavior, that is patients tend to use more county hospital and village health post services rather township health center services than their before. On the one hand, the income effect, jointly with the effects of education and disease pattern changes, leads people consume more higher quality and more sophisticated health services, which is represented by higher level of medical provider. On the other hand, the price effect, which represented by insurance and CMS

variables, lead people consume more health services provided by village health post.

The results reported here not only have the explanatory power for the change of patient's medical service seeking behavior, but also have the notable implication with health policy in rural China.

The most significant one for policy purposes are insurance effect. We have mentioned at the beginning of this paper that Chinese government already announced to reestablish cooperative medical system in rural area. Based on the results of this study, the patient utilization pattern will be driven by the reestablished CMS. The burden of rural population (or society) on health service and the quality of health service people could received will be influenced by future's CMS subsequently. Currently, several experimental studies on reestablishing CMS are or will be carried out in China. One of crucial issue is how to make balance between health financing collected from rural population or society and medical services received from different medical providers. The benefit package design, the powerful tool to drive people's utilization behavior, will be a extraordinary important for the development of future's CMS in rural China.

The second implication for health policy is that any health care system need to be dynamic, rather than static, to keep pace with people's changing demand and needs.¹³ With socio-economic development, the epidemiological transition has already occurred in rural china. Chronic and degenerative diseases are becoming the major cause of health problems.¹⁴ In order to meet changed health demand and needs, medical provider system is also need to be reformed. This reform is not only to promote technical and professional development, such as upgrading equipment and

increase technical competence of the rural health workers, but also to change resources allocation mechanism from central planning oriented to market oriented system with appropriate regulation and planning¹⁵ in order to keep the dynamic with the further change of people's health demand and needs.

The third hint to the health policy is on the aspect of self-treatment. The result of this study indicates the proportion of self-treatment will be increase with the age structure change. Some preliminary tabulate analysis of this study also suggested that the self-treatment rate also could be affected by the occupation and disease pattern. One of advantage of self-treatment is that it can decrease medical care cost, which include both direct service cost and indirect time consuming. But it might be influence the quality of services and lead to the increase of abuse medicine. Currently in China, people can get most of common medicines in drugs retail store without any prescription. Whether or not to conduct certain kinds of policies to regulate people's self-treatment behavior need to be concerned in the future.

It is the first time we employed MNL model to exam patient's medical service seeking behavior in rural China. This approach provided an opportunity to exam each factor's single effect on patient's choice behavior, which could lead to raise more concrete health policy suggestion. However, the data used in this study is only from Shunyi county, which only represent the relative rich population in rural China. The medical seeking behavior still need to be studied in the future in order to proof whether the preliminary finding in this study is appropriate for different class of rural population in China.

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