J. Basic. Appl. Sci. Res., 3(2)363-366, 2013
© 2013, TextRoad Publication

ISSN 2090-4304
Journal of Basic and Applied Scientific Research
www.textroad.com

The Production Function of Health: An Estimation Based on the Organization of the Islamic Conference (OIC) Member Countries' Case[1]

Seyed Ebrahim Hosseini Nasab[1], Samira Motaghi[2], Abbas Asari Arani[3], Lotfali Agheli[4]

[1] Faculty Member, Tarbiat Modares University, Faculty of Management and Economics, Department of economics, P.O. Box :14115-139, Tehran, Iran
[2]PH.D. Student, Department of economics, Faculty of Management and Economics, Tarbiat Modares University, Tehran, Iran
[3]Faculty Member, Department of economics, Faculty of Management and Economics, Tarbiat Modares University, Tehran, Iran
[4]Faculty Member, Department of economics, Research Center, Tarbiat Modares University, Tehran, Iran

ABSTRACT

This paper is an attempt to estimate the function known in the health economics literature as health production function, using data from the Islamic Conference Organization Member Countries. To capture the effect of economic, social and environmental factors on health, with the latter measured by life expectancy , we have modeled independent variables to include GDP, literacy rate, population , the rate of urbanization and AIDS infection rate. A random effect version of the panel data estimation procedure with OIC member country data spanning over the 1995-2009 period was utilized to obtain the parameter estimates. The estimates reveal that increases in GDP, literacy rate and the rate of urbanization enhance life expectancy, whereas increases in population and AIDS infections rate decrease it.
KEY WORDS: Health production Function, Health Costs, Islamic Conference member countries.

1. INTRODUCTION

A substantial share of Gross Domestic Product (of GDP) in any country is allocated to health sector, and scholars and policy makers are increasingly turning attention to this sector exploring ways of increasing its output. Despite all the efforts expended, the health situation in the Organization of the Islamic Conference (OIC) Member Countries still has much to commend for, especially when compared to the average global level.) For example, the average life expectancy in Afghanistan as a member of OIC is 42, which is well below the global average of 70 years. Similarly, the life expectancy of Muslim countries within the African Union is substantially below the global average. However, the situation improves considerably as we come to the oil rich Muslim countries that show a life expectancy of 77 years (WHO, 2009).

This paper is an attempt to estimate the function known in the health economics literature as health production function, using data from the Islamic Conference Organization Member Countries. To capture the effect of economic, social and environmental factors on health, with health measured by life expectancy, we have modeled independent variables to include GDP, literacy rate, and population, the rate of urbanization and AIDS infection rate. A random effect version of the panel data estimation procedure with OIC member country data spanning over the 1995-2009 period was utilized to obtain the parameter estimates. The estimates reveal that an increase in GDP, literacy rate and the rate of urbanization enhances life expectancy, whereas increases in population and AIDS infections rate decrease it. The paper has policy implications that can assist policymakers to base their health production programs on sound resource management schemes.

The paper is organized as follows: Section 2 is a formal representation of the health production function. In sections 3 and 4, after reviewing the data base and some procedural issues, we present our econometric model. Finally, in section 5 we discuss the estimates of the model and draw some implications for policy making in the health sector.

2. Health production function

Firms produce commodities, i, usually by combining inputs indifferent ways summarized in the following general form:

$Y_i = f(x_1, x_n)$ (1)

1 This paper is based on part of the work done in connection with dissertation of Samira Motaghi, with the first, third and fourth authors acting as major and minor advisors of the dissertation respectively.

***Corresponding Author:** Seyed Ebrahim Hosseini Nasab, Faculty Member, Tarbiat Modares University, Faculty of Management and Economics, Department of economics, Tehran, Iran; Email gebhn23@gmail.com

where:
x= Non-negative vector of inputs,
y= Non-negative vector of outputs.
This relationship is a formal representation of the production function, describing a process where the output and inputs have a maximum correlation. The most representative production function used in the health sector is due to Grossman (1972)[2]; It takes the following form:

$H = F(X)$ (2)
where:
X= Non-negative vector of inputs of the health sector, including economic, social and environmental variables.
H= Non-negative vector of outputs of the health sector (Grossman,1972; Rosen, 1982; Kautz, 2010)
$H = F(Y, S, V)$ (3)
$H = F(y_1, \ldots, y_n, s_1, \ldots, s_m, v_1, \ldots, v_l)$ (4)

H = the vector of outputs, typically measured by life expectancy (Behrman and Deolalikar, 1988;Grossman, 1972)
y = economic variables, 1…n
s = Social variables, 1…..m
v= environmental variables, 1….I
In this paper, y_1=GDP, and y_2=health expenditure. Since y_1 is correlated with y_1, onlyy_2 is used to represent economic variables.
s_1=literacy rate, s_2= population, s_3= life situation, with AIDS infections rate used to measure s_3
v= urbanization
Accordingly, the empirical model used here is:

$$\text{Ln } h = \beta_0 + \beta_1 \ln y + \beta_2 \ln s_1 + \beta_3 \ln s_2 + \beta_4 \ln s_3 + \beta_5 \ln v + u \qquad (5)$$

3. Choice of variables

Health output can be measured by life expectancy, Infant and child mortality rates , among other variables (Auster, 1988), But as it is often the case in most empirical studies, we use life expectancy as a measure of output(dependent variable) with inputs(independent variables) consisting of social and environmental factors.

The output variable choice depends on a number of factors, depending on the country or region under study, and data availability with consequence that estimation results may vary across countries and regions (Behrman, 1988).

Growth is expected to have a positive effect on health care consumption and health status(Grossman , 1972).Yet it has been observed that growth in GDP may increase psychological stress(faster machines, and thus less exercise) and lead to a diets higher in fat, (Fuchs, 1994; Sarachek,1969; Rodger,1979;Wilkinson, 1992;Tiansen,1994).Hence there is some uncertainty surrounding the actual sign of the GDP growth parameter.

The social variables used in the study are education, the literacy rate, and AIDS infection rate and population growth. Education has a high impact on health because it helps in choosing the right job, a suitable diet, and avoidance of unhealthy habits. It affects quality of life and the health of individuals (Berger, 1989; Rosen1982; Grossman 1972).In the present study, we have used adult literacy rate as a measure of education. The effect of literacy rate on health is expected to be positive. Another variable used to explain health is AIDS infection. There is some variability with respect to the effect of AIDS infection on health depending on the prevalence and treatment possibilities of AIDS in different communities. But, in general, the sign of this variable is predicted to be negative. Similar qualifications apply to our use of population as an input to health production.

The rate of urbanizations used to represent environmental variables. *Generally,* the effect of urbanization in health production function is uncertain(Thornoton,2002). Urbanization can improve health information production and dissemination systems and also access to health care services .(Rosen and Shultz1982). The negative aspect is the increase in the concentration health care expenditure in urban areas. On the other hand, the noise and air pollution that usually precedes urbanization can have a negative impact on health (Thornton, 2000).

4. METHODOLOGY

This paper uses time series and cross section data in the manner of panel data methodology that covers the OIC member countries over the period of 1995-2009. The data was compiled from the world bank and world health organization sources.

Equation 4 is the basis of our estimates and we have used the F test to test for its efficiency (Table 1)

[2] - Grossman(1972), Rosen (1982),Katz(2010)

Table1. the results of the F test for the efficiency of equation 4.
($Ln\ h = \beta_0 + \beta_1 \ln y + \beta_2 \ln s_1 + \beta_3 \ln s_2 + \beta_4 \ln s_3 + \beta_5 \ln v + \Theta$**)**

	Test statistics	Prob
	338.80	0.000

References: finding of research

Since according to table 1 estimates, The OLS estimator is inefficient. We need to use the GLS estimator with Hausman test to determine whether we need to use a fixed or random effect model (Table 2)

The result of table 2 indicate that a random effect model is the more robust method for estimating equation 4.

Table2. Hausman test

Titles	(statistic)	Prob
Result	0.000	1.000

References: finding of research

Table3. the results of the F test for the efficiency of OLS estimate of equation 4.
($Ln\ h = \beta_0 + \beta_1 \ln y + \beta_2 \ln s_1 + \beta_3 \ln s_2 + \beta_4 \ln s_3 + \beta_5 \ln v + \Theta$**)**

Test statistics	Prob
338.80	0.000

References: finding of research

Since the results in Table 3 indicate that the OLS estimate of equation 4 is inefficient, we used the Hausman test to determine whether the suitable panel data procedure, using a GLS, is of a fixed or random effect type(Table 4)
The results in table 4 indicate that random effect is the best method for the estimation of equation 4 .

Table4. Hausman test for fixed or random effect in the Panel Data procedure

(statistic)	Prob
0.000	1.000

References: finding of research

Hence we used the GLS to estimate the parameters of the equation 4, making sure that our estimates are free from homoscedasticity. homoscedasticity Table 5)

(Table5. Health production function estimates based on Panel data methodology

variables	Coefficient	Prob.
c	3.408	0.000
y	0.02	0.000
s_1	0.001	0.000
s_2	-0.017	0.06
s_3	-0.035	0.000
v	0.083	0.03
R-squared		0.76
Adjusted R-squared		0.75
Prob(F-statistic)		0.000
Durbin-Watson stat		1.95

(At 5% , 10% level)
References: finding of research

The estimates reported in Table 5 are from a logarithmic form of equation 4 and hence the coefficients obtained directly represent elastisities. Based on statistics reported in table 5, namely the R square and DW we may safely conclude that our model and estimation procedure choice is robust with respect to the results obtained.

Inferring from table 5 ,we can say growth in GDP, literacy and urbanization have a positive and significant effect on health output at least in the OIC member countries, such that a 1% increase in the GDP, for example, increases life expectancy by about 0.02 percent. Similarly, a 1% increase in literacy and urbanization, increases life expectancy by about 0.001 and 0.08 percent respectively.

A reduction in AID incidence can through adopting appropriate preventive measures at least in the area under study can improve the health status of the respective communities.

A negative sign of the coefficient for the population variable implies that higher population countries have more trouble in maintaining their health status. Hence strategies promoting population control in Islamic countries could improve the health status in these countries. At a more general level our analysis shows that the production function that we have estimated exhibits decreasing returns to scale. This conclusion is based on the

fact that sum of elasticities is less than 1 ,and this provides for Decreasing returns to scale characteristics of the faction..

5. Summery, conclusion

This paper examined the health Status of the OIC countries by using the health production function approach elaborated by Grossman. The data was compiled from World Bank, and the World Health Organization with data spanned over the 1995- 2009 period…The procedure employed was a data panel methodology. Our estimations reveal that an increase in GDP, literacy, urbanization and a reduction in population and AIDS infection have a significant effect on life expectancy. Our estimates also show that our health production function exhibits decreasing returns to scale.

Based on these findings we conclude the following implication. Health promotion policies need to focus on population control, AIDS prevention and literacy enhancement. In spite of the postulates that relate urbanization and GDP growth to health deterioration, we have found exactly the opposite. Policies that have been instrumental in raising the GDP growth rate and indirectly the sped of urbanization seem to have also been instrumental in raising health status at least in Muslim countries.

REFERENCES

Auster,R.,Levenson,I. and Sarachek, D.(1969), " The Production of Health,an Exploratory study", Journal of Human Resources, 4: 411-36.

Berger,M.and Leigh, J.(1989),"Schooling, self-selection and health" Journal of Human Resources,24:433-55.

Behrman,Jere R. And Anil B.(1988)," health and Nutrition,"Hand – book of Development Economics, volume I:1988, Amsterdam: North Holland.

Fuchs,V.,(1994),The Future of Health policy, Harvard university press: Cambridge.

Grossman,M.(1972),The Demand for Health : NBER: New York.

Grossman Model of Health Demand, presented by TIM Kautz, Econo 350, win 2010

Hadley,J.(1982), More Medical Care,Better Health, Urban Institute:Washington DC. Rosen,S. and Taubman, P.(1982),"Some socioeconomic Determinants of Mortality"Economics of Health Care:1982,New York.Thornton,J.(2002)," Estimating a Health Production Function for the US: SOME NEW evidence" Applied Economics,34: 59-62.

http://WWW.WHO. Com

http://WWW.World bank. Com