The Effect of Public and Private Health Expenditures on Life Expectancy in Different Countries: Using Panel Data Model

Tayyebe Azodi, Seyed Mohammad Javad Razmi, Ali Akbar Naji Meidani and Mohammad Ali Falahi

Volume 12, Issue 1

Eastern Macedonia & Thrace Institute Of Technology Press
The Effect of Public and Private Health Expenditures on Life Expectancy in Different Countries: Using Panel Data Model

Tayyebe Azodi, Seyed Mohammad Javad Razmi, Ali Akbar Naji Meidani and Mohammad Ali Falahi
Ferdowsi University of Mashhad, Iran

ARTICLE INFO
Article History
Received 9th April 2019
Accepted 28th May 2019
JEL Classifications
D90; D81; G31; G32

ABSTRACT
Purpose
This study aims to examine the factors that form the commitment
Design/methodology/approach
The sampling technique used is proportionate stratified random
sampling, with 100 respondents and the data collection happens in 2018. Methods of data
analysis in this study uses multiple linear regression, with the number of respondents as
many as 100 employees.
Findings
The result shows that the competence and organizational culture significantly influence
the commitment. This implies to the manager that the increase of employee competence
and the suitable organization culture are very important in strengthening their employee
commitment.
Research limitations/implications
The limitation of this research is in the amount of variables that are only three, and only
focus in one object.
Originality/value
The findings of this research are the new ones, by developing the previous theory, using a
new place and time.

JEL Classifications
D80; D81; G31; G32

Keywords:
competence, organizational
culture and commitment

1. Introduction

Everyone has the right to have a healthy, productive and
high-quality life with an acceptable lifetime without
illness and disability. In addition to the individual,
governments are also responsible for this and it is
considered as one of the preconditions for sustainable
development; but health systems are the most complex
systems in all countries as health is affected by social,
environmental, political, governmental factors, as well as
economic policies, etc. In addition to these cases, health
is also affected by the access to health expenditure, which requires the use of national resources
by both the private and public sector, whose limited
resources and facilities have always been mentioned in
the past and will be imposed more severely on the socio-
economic conditions. On the other hand, health
expenditure is associated with great uncertainty, as
many diseases are randomly created because of
unforeseen expenditures imposed on people so that
sometimes their decision is related to life and death; thus
the proper use of facilities and available resources and
the promotion of their efficiency is a crucial issue to
respond to the needs of communities. Given that health
is considered as the center of sustainable economic,
social, political and cultural development of societies and

©Eastern Macedonia and Thrace Institute of Technology

Corresponding Author: Tayyebe Azodi
E: azodi2015@gmail.com
DOI: 10.25103/ijbesar.121.07
developed societies, but that in these countries, people spend on health in order to postpone death, obtain more peace against the anxieties of life, and for better and more accurate diagnosis of diseases, etc. [5].

Socio-economic factors such as lifestyle, law and order, education and income level, employment, urbanization, etc. are the most important factors that affect health indicators [6, 7], for example the global effect of income on health status has been confirmed through various channels such as better nutrition, housing, better sanitation, etc. as well as Employment rate has a positive effect on life expectancy, unemployment leads to social exclusion, anxiety and health-threatening behaviors such as suicide and on the other hand, employment reduces deprivation and anxiety and leads to better earning to obtain better facilities, nutrition and education and improved living conditions and as a result increased health of individuals [8]. Urbanization also has a positive effect on health as with the increase in urban population, especially in developing countries, the

countries generally enjoy more advanced facilities and care, higher education and better socioeconomic conditions, all of which have a positive effect on human health [9, 10, 11, 12, 13, 14]. In addition to these factors, public and private resources allocated to the health sector also help to improve health, but the effect of these two variables is not the same on different health indicators in different regions [15].

Given that the concept of health expenditure may vary from country to country, Poullier et al. (2002)[16], presented a general classification of health expenditure. In figure (1), the total health expenditures are considered as total public and private expenditures on all goods and services related to health. In this figure, the total health expenditures are divided into two categories: public and private health expenditures and the way of financing the expenditures is identified in the branches at the end of the figure.

![Classification of health expenditure](image)

**Figure 1. Classification of health expenditure.** Poullier et al. (2002).

On the relationship between public health expenditure and health status, two points should be considered: First, there is a large gap between the apparent potential of public health expenditure and their actual performance to improve health [17].

Reviews of the cost effectiveness of preventive and primary curative interventions suggest that a significant fraction of below five deaths could be avoided for as little as $10, and in many cases, under $1000 per death averted. However, in practice, cross-national differences in public spending on health, account for essentially none (one seventh of 1%) of the differences in health status. This extremely small actual association estimated from the cross-national data, implies that the typical public spending on health per child death averted in developing countries is $50,000 to 100,000. This is a striking discrepancy between the apparent potential and actual performance. Secondly, differences in infant mortality and children are well explained by socioeconomic factors, while public expenditure has a very little explanatory power [18].

### 2. Literature review

In the following, some of the studies on the relationship between health spending and health indicators will be referred to. (Sadeghi & Mohammad Khanhghani, 2014 [19]) believed that private health expenditure has a greater effect on life expectancy than public expenditure, while public expenditure compared to private expenditure is more effective in reducing mortality and infant mortality in countries with average income. (Farag, 2009 [20]), also states that one percent increase in health expenditure will reduce infant mortality by 0.1 percent. (Bokhari, Gai & Gottret, 2007 [21]) believed that although economic growth is certainly an important factor for health, public expenditure is equally important. The results of the study of (Gottret & Schieber, 2006 [22]) which was conducted by the data from 81 countries, mostly low- and middle-income countries, showed that public health expenditure compared to income has a more effect on children’s mortality but has less effect on maternal mortality. On the other hand, (Self & Grabowski, 2003 [23]) believed that in countries where the public sector is very large, public health expenditure does not help much in improving health. Generally, the effect of public expenditure is more in countries where there is a balanced relationship between public and private sectors. Thus, it seems that their efficacy in countries with larger private sector also needs the development of health.
Examining the relationship between health expenditure and the health status in Iran, (Asgari & Badpa, 2011 [24]) concluded that although total health expenditure is a crucial component in improving the health status in Iran, public health expenditure is relatively more effective on health status in Iran. (Mohammad Zade, Nafisi Moghadam & Heydari, 2014 [25]) also suggest that three variables including GDP per capita, the ratio of public health expenditure to GDP and the ratio of private expenditure to GDP have a negative and significant effect on the mortality rate for children under seven years of age as an indicator of health. The increase in public health expenditure can dramatically improve health indicator in countries with low human development. (Rajkumar & Swaroop, 2008 [26]) believe that public health expenditure further reduces children’s mortality rates in countries that have good governance. In general, public expenditure, in fact, has little effect on health and education in countries that are governed poorly. These findings have important outcomes for increasing the efficiency of public expenditure and are also an experience especially for developing countries where public health expenditure is relatively low, coupled with poor governance.

3. Methodology

The econometrics model was developed as:

$$LEB_i = \alpha + \beta_1 HPU_i + \beta_2 HPR_i + \beta_3 GDP_i + \beta_4 EMP_i + \beta_5 URB_i + U_i \quad (1-2)$$

In the equation (1-2) $i = 1, 2, ..., N$ and $t = 1, 2, ..., T$; that denote number of countries ($i = 1, 2, ..., 142$ [N]) and time period ($t = 1996, 1997, ..., 2014$ [T]), respectively. $\alpha$ are constants and $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are coefficients. $U$ is the error term that are normally distributed with zero mean and homoscedastic variance. All the variables in Eq are in logarithmic form. The health status proxy dependent variables in equations are LEB; It is the average years of life that will be lived by a newborn in a given year if living conditions and the pattern of mortality stay the same throughout its life. independent variables consisting of two main variables: public expenditure (HPU) and private expenditure (HPR) as a percentage of GDP and per capita GDP variables in terms of purchasing power (GDP), employment to population ratio in 15-year old people and older to the total population (estimated by ILO) (EMP), the proportion of urban population to the total population (URB), as control variables and $U$ is also confounding element. Statistics and information about the variables needed were collected from the database of the World Bank and World Health Organization [27, 28].

3.1. The Descriptive Statistics

In this section, the average of public and private health expenditure for each income group is given in a table below:

<table>
<thead>
<tr>
<th>Table 1. Descriptive statistics of variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low income levels</td>
</tr>
<tr>
<td>Variables</td>
</tr>
<tr>
<td>LEB</td>
</tr>
<tr>
<td>HPU</td>
</tr>
<tr>
<td>HPR</td>
</tr>
<tr>
<td>GDP</td>
</tr>
<tr>
<td>EMP</td>
</tr>
<tr>
<td>URB</td>
</tr>
<tr>
<td>Lower middle income levels</td>
</tr>
<tr>
<td>LEB</td>
</tr>
<tr>
<td>HPU</td>
</tr>
<tr>
<td>HPR</td>
</tr>
<tr>
<td>GDP</td>
</tr>
<tr>
<td>EMP</td>
</tr>
<tr>
<td>URB</td>
</tr>
<tr>
<td>Upper middle income levels</td>
</tr>
<tr>
<td>LEB</td>
</tr>
<tr>
<td>HPU</td>
</tr>
<tr>
<td>HPR</td>
</tr>
<tr>
<td>GDP</td>
</tr>
<tr>
<td>EMP</td>
</tr>
<tr>
<td>URB</td>
</tr>
<tr>
<td>High income levels</td>
</tr>
<tr>
<td>LEB</td>
</tr>
<tr>
<td>HPU</td>
</tr>
<tr>
<td>HPR</td>
</tr>
</tbody>
</table>
As seen, the differences among different income groups are very impressive, for low income and lower-middle countries the difference between the average ratio of public and private health expenditures is low and in most low-income and lower-middle income countries the average public expenditure is more than private expenditure. As seen in upper-middle income countries the average share of public health expenditure is more than private health expenditure. Information related to health expenditure in high-income countries, shows that most health expenditure is funded by the public sector and a huge difference is observed in the average public and private health expenditures.

3-2. Chow test results

In this study we estimate the model by using panel data method. For using panel data model particular test method are used which will be discussed in this section. Before discussion about estimation and model analysis, it is necessary that why this study try to use the panel data method. In other words, are the countries - which are going to be studied - homogeneous or not? If the countries are homogeneous Pool Data method can be easily used by ordinary least squares otherwise, the necessity of using panel data is required. In other words, based on statistical concept we have:

\[ Y_i = Z\delta_i + U_i \]  \quad \text{Conditional Model}

\[ Y_i = Z\delta_i + U_i \]  \quad \text{Non-Conditional Model}

3-3. Hausman Test

Hausman Test is used for determining the method of estimation in panel data approach which its statistic is (H) with distribution with K degree freedom (number of explanatory variables). If the null hypothesis rejected in the first test, the second test (Hausman Test) for the method of estimation in panel data methods will be used. In the Fixed Effects method, time aspect is not considered and only the effects which belong to each section of the time will be consider as individual effects. In the Random Effects method, time aspect is considered and the effects which belong to each section of the time will be consider as individual effects in the model. Hausman test statistic is as follows:

\[ H = \frac{\hat{\beta}_{FE} - \hat{\beta}_{RE(GLS)}}{VAR(\hat{\beta}_{FE}) - VAR(\hat{\beta}_{RE(GLS)})} \]

This test is hypothesis testing of uncorrelated individual effects and the explanatory variables which based on this test the generalized least squares estimation (GLS) under the H hypothesis is consistent and under H, hypothesis is inconsistent. These hypothesis are as follows:

\[ H_0 : E(u_i / x_i) = 0 \]

\[ H_1 : E(u_i / x_i) \neq 0 \]

The rejection of the null hypothesis implies that the test method is fixed effects.

### Table 2. Chow test results

<table>
<thead>
<tr>
<th>Low countries</th>
<th>Statistics</th>
<th>P-value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Low income</td>
<td>225.8</td>
<td>0</td>
<td>H, is rejected</td>
</tr>
<tr>
<td>- Lower-middle income</td>
<td>387.9</td>
<td>0</td>
<td>H, is rejected</td>
</tr>
<tr>
<td>- Upper-middle income</td>
<td>342.7</td>
<td>0</td>
<td>H, is rejected</td>
</tr>
<tr>
<td>- High income</td>
<td>88.86</td>
<td>0</td>
<td>H, is rejected</td>
</tr>
</tbody>
</table>

### Table 3. Hausman test results

<table>
<thead>
<tr>
<th>Income groups</th>
<th>Statistics</th>
<th>P-value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Low income</td>
<td>18.27</td>
<td>5</td>
<td>H, is rejected</td>
</tr>
<tr>
<td>- Lower-middle income</td>
<td>4.11</td>
<td>0.5</td>
<td>H, is no rejected</td>
</tr>
<tr>
<td>- Upper-middle income</td>
<td>6.1</td>
<td>0.2</td>
<td>H, is no rejected</td>
</tr>
<tr>
<td>- High income</td>
<td>205.4</td>
<td>0</td>
<td>H, is rejected</td>
</tr>
</tbody>
</table>

3-4. The results of model for different income groups
As seen in Table 4, Coefficients related to health expenditure Low income groups show, assuming that other factors are constant, 10 percent increase of public health expenditure increases life expectancy by 0.02% and also 10 percent increase of private health expenditure increases life expectancy by 0.03% in low-income countries. Coefficients related to health expenditure in Lower middle income show, assuming that other factors are constant, 10 percent increase of public health expenditure increases life expectancy by 0.009% and also 10 percent increase of private health expenditure increases life expectancy by 0.01% in low-income countries. As well as Coefficients related to public and private health expenditure in Upper Middle income show, assuming that other factors are constant, 10 percent increase of public and private health expenditure increases life expectancy by 0.02% and by 0.01%, respectively, in this income group. The coefficient related to private health expenditure in the high income countries show, assuming that other factors are constant, 10 percent increase of private health expenditure increases life expectancy by 0.003%. As seen, public expenditure in high-income countries has not a significant effect on life expectancy that this type of expenditure in these countries is more effective but they have not a significant effect on health in high-income countries that the result was contrary to expectation, but according to the law of diminishing returns it is consistent with theoretical foundations as well as previous studies; as according to Self and Grabowski rich countries enjoy more health, but more health expenditure, especially public health expenditure in these countries has little effect on health, and the reason of this average improvement is their better economic and educational status; but it justifies government intervention in middle-income countries and less developed countries in which the participation rate of public sector is relatively smaller and explains that this type of expenditure in these countries is more effective on health; thus regardless the economic status, the more intervention of public sector in health reduces the efficiency of health sector; therefore, in these countries diminishing returns begin with the expansion of public sector in health area. In addition, private health expenditure in all income groups improves life expectancy at birth, except high-income groups, but the effect on the target indicator is not the same in different countries. It was expected that private and public expenditures have significant and positive effect on life expectancy at birth in all groups; while unexpectedly according to the results obtained in the study period, coefficients related to public expenditure in lower and upper low and middle income groups are significant and positive, but they have not a significant effect on health in high-income countries that the result was contrary to expectation, but according to the law of diminishing returns it is consistent with theoretical foundations as well as previous studies; as according to Self and Grabowski rich countries enjoy more health, but more health expenditure, especially public health expenditure in these countries has little effect on health, and the reason of this average improvement is their better economic and educational status; but it justifies government intervention in middle-income countries and less developed countries in which the participation rate of public sector is relatively smaller and explains that this type of expenditure in these countries is more effective on health; thus regardless the economic status, the more intervention of public sector in health reduces the efficiency of health sector; therefore, in these countries diminishing returns begin with the expansion of public sector in health area. In addition, private health expenditure in all income groups has a significant and positive effect on life expectancy at birth.

Health area is so that on the one hand, is affected by many factors and on the other hand many sectors are affected by it, this area is very critical, yet it has its specific complexity. In addition, each community has different socio-economic, environmental and governance

### Table 4. Model results of the regression model for different income groups

<table>
<thead>
<tr>
<th>Variables</th>
<th>Low Income</th>
<th>Lower Middle Income</th>
<th>Upper Middle Income</th>
<th>High Income</th>
<th>Coefficient</th>
<th>Statistics</th>
<th>Coefficient</th>
<th>Statistics</th>
<th>Coefficient</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>LHPU</td>
<td>0.02***</td>
<td>5.37</td>
<td>0.009**</td>
<td>2.11</td>
<td>0.02***</td>
<td>(0.000)</td>
<td>5.24</td>
<td>(0.000)</td>
<td>0.00001</td>
<td>(0.5)</td>
</tr>
<tr>
<td>LHRP</td>
<td>0.05***</td>
<td>4.27</td>
<td>0.01**</td>
<td>2.3</td>
<td>0.01***</td>
<td>(0.000)</td>
<td>3.93</td>
<td>(0.000)</td>
<td>0.003***</td>
<td>(0.000)</td>
</tr>
<tr>
<td>LGDP</td>
<td>0.14*</td>
<td>9.94</td>
<td>0.08***</td>
<td>15.40</td>
<td>0.05***</td>
<td>(0.000)</td>
<td>12.95</td>
<td>(0.000)</td>
<td>0.01***</td>
<td>6.7</td>
</tr>
<tr>
<td>LEMP</td>
<td>0.18***</td>
<td>2.71</td>
<td>0.12***</td>
<td>5.11</td>
<td>0.1***</td>
<td>(0.000)</td>
<td>5.17</td>
<td>(0.01)</td>
<td>0.01***</td>
<td>2.56</td>
</tr>
<tr>
<td>LURB</td>
<td>0.34***</td>
<td>14.35</td>
<td>0.15***</td>
<td>9.76</td>
<td>0.12***</td>
<td>(0.000)</td>
<td>7.62</td>
<td>(0.000)</td>
<td>0.06***</td>
<td>5.86</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>3.79</td>
<td>2.35</td>
<td>21.5</td>
<td>2.7</td>
<td>26.27</td>
<td>3.9</td>
<td>0.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.76</td>
<td>0.56</td>
<td>0.48</td>
<td>0.48</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>253.9</td>
<td>858.3</td>
<td>652.2</td>
<td>652.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Explanation:** The dependent variable is the log of life expectancy (LEB)

### 4. Results and Discussion

This study aimed to evaluate the effect of public and private expenditures on life expectancy in different income groups using panel data model. For this purpose, the World Bank classification was used in which countries are divided into high, (lower and upper) low and medium income groups and given that data were not available, the period of review was limited to 1996-2014. The findings show that health expenditure, regardless of the financing source, improves life expectancy at birth, but the effect on the target indicator is not the same in different countries.

In addition, health expenditure in all income groups improves life expectancy at birth, except high-income groups, but the effect on the target indicator is not the same in different groups.
conditions, etc. that all of these factors affect health. There are also many input indicators in the health sector that considering each of these indicators as the dependent variable, different results may be obtained, thus, given the complexities, accurate and comprehensive results cannot be obtained and given the specific circumstances of each country or group the results cannot be generalized to other groups.

References


