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

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ABSTRACT

Purpose

International research shows that improving health by increasing health expenditures can vary in different countries. In the present study, the effect of public and private health expenditures of GDP was examined using life expectancy as a health indicator.

Design/methodology/approach

The study evaluated 142 countries with different income levels using panel data from the period 1996-2014. For this purpose, the World Bank classification was used to identify Low, Lower-Middle, Upper-Middle and High-income countries. This study were the panel data method and estimated using Eviews9 and Stata12 software.

Findings

The results show that public expenditure in high-income countries has no significant effect on life expectancy, but private expenditure has a significant and positive effect. The effect of public and private expenditures is significant in the middle and low-income groups, but in the upper middle-income group, the effect of public expenditure is greater than private expenditure; whereas in lower middle and low-income groups, the effect of public expenditure on life expectancy is lower than private expenditure.

Research limitations/implications

The limitation of this research is in the amount of variables.

Originality/value

The findings of this study can assistance allocate resources, control expenditure and provide economic solutions in the health segment.

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 [1]. 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

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a worthy means and goal, which is important in the infrastructure of different parts of society, economists and policy-makers have paid lots of attention to find an optimal way for community health promotion [2]. Health issue was forgotten at the international level until after World War I, when the Statute of the League of Nations was prepared. Health expenditure as a criterion indicates the amount of resources allocated to the health sector, and statistics related to it are always of interest to theorists, policy-makers and practitioners in the health sector. Government and policy-makers tend to measure the relationship between health expenditure and health status as international comparisons of health expenditure can provide accurate information for health policy-makers to attract support for policy changes [3]. Actually, the key element is the distinction between public health expenditure and private health expenditure. Whereas public expenditure is basically a political decision, private expenditure reflects the way individuals distribute their available income depending on their preferences. [4]. For the first time, it was Newhouse (1977) that in his study, referred to the dual nature of health services in industrialized countries compared to other countries. He believes that in developed societies, the nature of health expenditure is not usually to escape from epidemiological diseases and premature deaths due to infectious diseases, faced by most of the people in less

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, as 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.

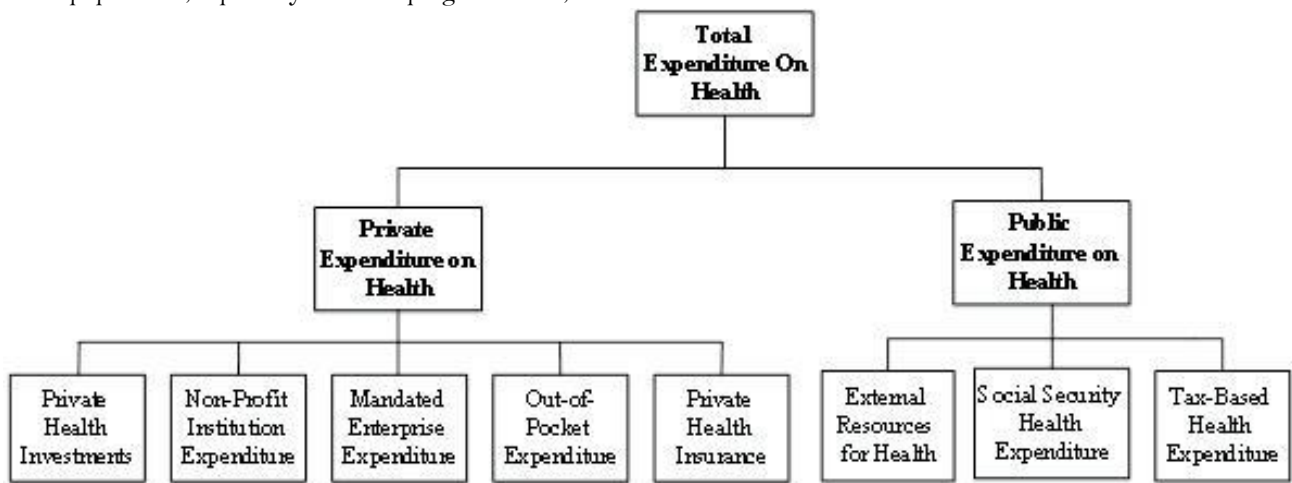


Figure 1. Classification of health expenditure. Poullier et al. (2002).

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 & Mohammadi Khanghani, 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

public sector.

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:

$$LEB_{it} = \alpha_i + \beta_1 HPU_{it} + \beta_2 HPR_{it} + \beta_3 GDP_{it} + \beta_4 EMP_{it} + \beta_5 URB_{it} + U_{it} \quad (1-2)$$

In the equation(1-2) $i = 1, 2, \dots, N$ and $t = 1, 2, \dots, T$; that denote number of countries ($i = 1, 2, \dots, 142$ (N)) and time period ($t = 1996, 1997, \dots, 2014$ (T)), respectively. α 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_{it} 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:

Table1. Descriptive statistics of variables

Variables	Average	Standard deviation	Minimum	Maximum
Low income levels				
LEB	53.98	6.02	35.65	69.6
HPU	2.3	1.8	44	6.93
HPR	3.42	1.73	1.4	10.9
GDP	1212.7	4.3	454.8	3421.2
EMP	71.8	9.53	46.3	87.8
URB	27.6	11.17	7.41	59
Lower middle income levels				
LEB	63.84	8.06	42.02	75.62
HPU	2.49	1.4	0.55	9.08
HPR	2.82	1.28	0.51	7.92
GDP	4271	2133	1040.25	10748
EMP	58.1	10.5	32.9	82.4
URB	41.2	14.95	12.9	69.5
Upper Middle income levels				
LEB	69.21	6.08	42.5	79.4
HPU	3.22	1.32	0.79	147.14
HPR	2.5	1.32	0.44	8.46
GDP	11420	5387	2774.4	42957.3
EMP	54.67	11.06	29.6	81.9
URB	59.54	14.35	29.57	87.6
High income levels				
LEB	77.23	3.38	68.4	83.58
HPU	5.1	2.1	0.88	10
HPR	2.22	1.32	0.16	8.98

GDP	36280.3	183374	8431.7	110135
EMP	57.27	7.78	38.7	81.9
URB	75.3	16.35	8.55	98

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:

$$Y_i = Z_i\delta_i + U_i \quad \text{Conditional Model}$$

$$Y_i = Z_i\delta_i + U_i \quad \text{Non-Conditional Model}$$

$$i = 1, 2, \dots, N$$

The statistics for testing the hypothesis is as follows:

$$F = \frac{\frac{2}{(N-1)} \frac{R^2 - R}{(1 - R^2)}}{\frac{2}{(NT - N - K)} \frac{R}{UR}}$$

Which N represents the number of country, K the number of explanatory variables, T the number of observations over the time. In this test (which is called as significance effects of group test) when null hypothesis rejected, using of panel data is required. For decision about using of Fixed Effects method or Random Effects method, it must be considered that fixed effect method is usually used when total population is considered and if samples selected from big population, random effect method will be better method [29, 30].

Table 2. Chow test results

Group countries	Statistics	P-value	Result
Low income	225.8	0	H ₀ is rejected
Lower-middle income	387.9	0	H ₀ is rejected
Upper-middle income	342.7	0	H ₀ is rejected
High income	88.86	0	H ₀ is rejected

3-3. Hausman Test

Hausman Test is used for determining the method of estimation in panel data approach which its statistic is (H) with χ^2 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:

$$H = \frac{\rho_{FE} - \rho_{RE(GLS)}}{VAR(\beta_{FE}) - VAR(\beta_{RE(GLS)})}$$

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 H₀ hypothesis is consistent and under H₁ hypothesis is inconsistent. These hypothesis are as follows:

$$H_0 : E(u_{it} / x_{it}) = 0$$

$$H_1 : E(u_{it} / x_{it}) \neq 0$$

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

Table 3. Hausman test results

Income groups	Statistics	P-value	Result
Low income	18.27	5	H ₀ is rejected
Lower-middle income	4.11	0.5	H ₀ is no rejected
Upper-middle income	6.1	0.2	H ₀ is no rejected
High income	205.4	0	H ₀ is rejected

3-4. The results of model for different income groups

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

	Low Income	Lower Middle Income	Upper Middle Income	High Income				
Variables	Coefficient	Statistics	Coefficient	Statistics	Coefficient	Statistics	Coefficient	Statistics
LHPU	0.02*** (0.000)	5.37	0.009** (0.03)	2.11	0.02*** (0.000)	5.24	0.00001 (0.5)	2
LHPR	0.03*** (0.000)	4.27	0.01** (0.04)	2.3	0.01*** (0.000)	3.93	0.003*** (0.000)	3.49
LGDP	0.14* (0.000)	9.94	0.08*** (0.000)	15.40	0.05*** (0.000)	12.95	0.01*** (0.000)	6.7
LEMP	0.18*** (0.007)	2.71	0.12*** (0.000)	5.11	0.1*** (0.000)	5.17	0.01*** (0.01)	2.56
LURB	0.34*** (0.000)	14.35	0.15*** (0.000)	9.76	0.12*** (0.000)	7.62	0.06*** (0.000)	5.86
C	1	3.79	2.35	21.5	2.7	26.27	3.9	0.06
R.	0.76	0.56	0.48	0.48				
F	253.9 (0.000)	858.3 (0.000)	652.2 (0.000)	652.2 (0.000)				

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

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 the possible reason for this can be due the fact that in high income groups a high percentage of GDP is included, thus the law of diminishing returns begins and continues until the effect of public expenditure has no significant effect on life expectancy. In addition, there are many other factors that affect life expectancy, in high-income groups the effect of other factors may be to the extent that public expenditure has not significant effect on life expectancy.

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. 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

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.

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References

1. Lu C, Schneider M.T, Gubbins P, Leach- Kemon, K, Jamison D, Murray C.J. Public financing of health in developing countries: a cross-national systematic analysis. *The Lancet* 2012; 375(9723): 1375-1387.
2. Deluna JR. Peralta, T. F. Public Health Expenditures, Income and Health Outcomes in the Philippines. University of Southeastern Philippines, School of Applied Economics 2014.
3. Moreno-Serra R, Smith P.C. Does progress towards universal health coverage improve population health?. *The Lancet* 2012; 380(9845): 917-923.
4. Aísa R, Clemente J, & Pueyo F. The influence of health expenditure on longevity: a reconsideration. *International Journal of Public Health* 2014.
5. Newhouse J.P. Medical-care expenditure: a cross-national survey. *The Journal of Human Resources* 1977; 12(1): 115-125.
6. Çevik S, Taşar M.O. Public spending on health care and health outcomes: cross-country comparison. *Journal of Business Economics and Finance* 2013; 2(4): 82-100.
7. Thornton J. Estimating a health production function for the US: some new evidence. *Applied Economics* 2002; 34(1): 59-62.
8. Mikkonen J, Raphael D. Social Determinants of Health: the canadian facts York University, School of Health Policy and Management 2010.
9. Preston S.H. The changing relation between mortality and level of economic development. *Population studies* 1975; 29(2): 231-248.
10. Wilkinson R.G. Income distribution and life expectancy. *BMJ: British Medical Journal* 1992; 304(6820): 165.
11. Winegarden C.R. A simultaneous-equations model of population growth and income distribution. *Applied Economics* 1978; 10(4): 319-330.
12. Winegarden C.R. Income redistribution versus accelerated economic growth: A comparison of demographic effects. *Oxford Bulletin of Economics and Statistics* 1984; 46(3): 255-271.
13. Saunders, P. Income distribution, poverty and health in Australia. In *présenté au colloque du Centre d'étude de marché du travail, Université d'Aarhus* 1996: 21.
14. Kawachi I, Kennedy B.P. The relationship of income inequality to mortality: does the choice of indicator matter? *Social science & medicine* 1997; 45(7): 1121-1127.
15. Novignon J, Olakojo S.A, Nonvignon J. The effects of public and private health care expenditure on health status in sub-Saharan Africa: new evidence from panel data analysis. *Health economics review* 2012; 2(1): 22.
16. Poullier J.P, Hernandez P, Kawabata K, Savedoff W.D. Patterns of global health expenditures: results for 191 countries. Geneva: World Health Organization 2002.
17. Jamison D.T, Mosley W.H. Disease control priorities in developing countries: health policy responses to epidemiological change. *American journal of public health* 1991; 81(1): 15-22.
18. Filmer D, Pritchett L. The impact of public spending on health: does money matter? *Social science & medicine* 1999; 49(10): 1309-1323.
19. Sadeghi S K, Mohammadi e khanghani R. The impact of health care expenditure on health indicators: an empirical analysis in middle income countries. *Journal of Payesh* 2014; 4(1): 7-14.
20. Farag M. Health Financing and Health Outcomes in the Eastern Mediterranean Region. Brandeis University 2009; 10-20.
21. Bokhari F.A, Gai Y, Gottret P. Government health expenditures and health outcomes. *Health Economics* 2007; 16(3): 257-273.
22. Gottret P.E, Schieber G. Health financing revisited: a practitioner's guide. World Bank Publications 2006.
23. Self S, Grabowski R. How effective is public health expenditure in improving overall health? A cross-country analysis. *Applied Economics* 2003; 35(7): 835-845.
24. Asgari H, Badpa P. The effects of public and private health expenditure on health status of individuals in Iran. *Journal of Medical Sciences* 2015; 23(5).
25. Mohammad Zade p, Nafisi Moghadam M, Heydari H. The effects of public and private health care expenditures on health in selected countries, with panel data approach. *First International Conference on Emerging Trends in business management*. Tabriz University, Tabriz and Industrial Management Institute 2014.
26. Rajkumar A.S, Swaroop V. Public spending and outcomes: Does governance matter? *Journal of development economics* 2008; 86(1): 96-111.
27. <http://databank.worldbank.org>
28. <http://www.who.int/en/>
29. Baltagi B. H. *Econometric Analysis if Panel Data, Third Edition*. John Wiley and Sons. 2005.
30. Baltagi B. *Econometric analysis of panel data. Fourth edition*. John Wiley & Sons. 2008.