The Relationship between Health Expenditure and Economic Growth in Turkey from 1980 to 2015

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Abstract: In this study, the change in health spending -both private and public- is examined with regard to the effects of the output level in Turkey from 1980 and 2015 by using investment. This research study aims to investigate the association between healthcare expenditure out of Gross Domestic Product (GDP) and GDP per capita by using ARDL, which is autoregressive distributed lag bounds testing approach of co-integration developed by Pesaran, Shin and Smith (2001). Since this method provides a comprehensive econometric analysis for the data that are stationary at various levels, and the existence of the co-integration among the variables can be detected even though the data becomes stationary at I(0) or I(1), employing ARDL is a quite convenient method for the study. The results of bounding test to co-integration represent that the variables are co-integrated, there is a significant relationship between them in the long-run.

1. Introduction

Health is an important indicator to see the standards of living in a country. The productivity of labor depends on health and educational conditions of workers. Therefore, health expenditures which is made by the government is an important factor to accumulate human capital. This paper conducts an analysis that investigates the link between the health expenditures and economic growth in Turkey for the period 1980 to 2015. Health has become significant as the technology developed. Hence, there are more opportunities for people in terms of health issues, and improvement of living standards, which leads to productivity for work and in other areas. If workers' productivity increases, it will have an effect on the production process. Most importantly, this increase in the productivity will affect the output level. In other words, technology gets more advanced in time, and health is one of the developed areas in a very wide scope. In a globalized world, people can benefit from these developments, and it will affect every part of their lives such as productivity, which will also have an effect on the output level of the country. Therefore, countries are interested in acquiring health developments.

The first section of this study includes a literature review. In the second section the data and methodology of this study to analyze the relationship between health expenditures and economic growth is presented and the last section is the conclusion of this study.

2. Literature Review

Health has been considered as one of the remarkable elements that results in the increase in Gross Domestic Product (GDP) for a country. Thus, there have been some studies related to the relationship between health and economic growth. If we look at these previous studies, there are remarkable outcomes on this issue.

Atılgan, Kılıç and Ertuğrul (2017) states that health expenditure and economic growth have a dynamic causal relationship. This study aims to investigate whether growth and health expenditure are

co-integrated or not by using bound test approach, Autoregressive-Distributed Lag Approach (ARDL) and Kalman filter modelling.

Bedir (2016) explains that the relationship between economic growth and health care expenditure in emerging markets in the region of Europe and Middle East African and Asian countries. In this study, it is considered that human accumulation is very crucial for growth in a country because in endogenous growth models capital accumulation is essential, and in order to be to raise capital accumulation, healthcare expenditure is quite influential. The author used econometric methods of modified version of the Granger (1969), Toda and Yamamoto (1995) causality test and also Dolado and Lütkepohl (1996) to explain this relation. The results of the tests suggested that if income level increases healthcare expenditures might increase as well for some developing countries. More importantly, healthcare expenditures' differences are related to income levels for the investigated countries. In other words, economic growth in a country means an increase in the healthcare expenditure proportion in outcome of the country, which causes GDP to increase once again.

Cetin and Ecevit (2010) studied on the issue of the effects of health on the economic growth in OECD countries by using panel data analysis method. In their paper, they asked the question whether there is any long run association between health expenses and growth is examined empirically. Although import, export, employment and productivity have a positive effect on economic growth, and these variables are statistically significant for this analysis, the results for the health expenditures is different from expected. It means that empirical analysis do not provide results related to the hypothesis which health growth determines economic growth.

Eggoh, Houeninvo and Sossou (2015) searched about the connection between human capital and economic growth in 49 African countries for the period between 1996 and 2010. In this study, education and health related variables are used as indicators of human capital. In addition, traditional cross-section and dynamic panel techniques are used in order to be able to investigate the connection between variables. The test results suggest that economic growth is affected by education and health expenditures in a negative way. Hence, the authors assert that since corruption, bureaucracy and underinvestment exist in these countries, and also the expenditures are inefficient, education and health expenditure can have a negative impact on the growth.

Halıcı-Tülüce, Doğan and Dumrul (2016) investigated the influence of health expenditure on economic growth. This study contains panel data analysis of low-income and high-income economies between 1995-2012 and 1997-2009. Twenty-five high-income and nineteen low-income countries' data are used, and in the short-run, bilateral relationship between growth and health expenditure is analysed, in the long run, one-way causality from economic growth to government spending on health is examined. It can be concluded that there is positive relationship between government spending on health and economic growth, which also means that public health expenditures have a role of determination of economic growth. Last but not least, by performing an analysis for the difference between private and public expenditure, it can be stated that if both private and public expenditures are raised, it also leads to an increase in the positive effect of health expenditures on economic growth because productivity of the labours depend upon their health status. The healthier the workforce, the more efficiency in the economy of the country.

Hassan and Kalim (2012) argues that if there is a long run relationship and triangular causality among education, health and economic growth for Pakistan by conducting time series analysis from 1972 to 2009, and the variables used in this study are per capita education expenditures and per capita health expenditures and real GDP per capita. The results indicate that there is no Granger causality between per capita health expenditures and real GDP per capita in the short-run; on the other hand, there is two-way causality among real GDP per capita, per capita education expenditures and per capita health expenditures in the long-run.

Maitra and Mukhopadhyay (2012) studied on the issue of government spending on education, health care and economic growth in twelve countries of Asia and the Pacific. The authors argue that whether there exists a connection between education expenditures of the governments and health sectors, which leads to economic growth. By conducting Johansen co-integration tests for those countries, it is concluded that public healthcare expenditures, GDP and public education expenditures

are co-integrated for Bangladesh, Kiribati, Malaysia, Maldives, the Philippines and the Republic of Korea; on the other hand, in Fiji, Nepal, Singapore, Sri Lanka, Tonga and Vanuatu the variables are not co-integrated.

The study of Munnell (1992) states that public policies for infrastructure, related to the investment decisions, are based on economic reasoning. It means that this investment project is determined according to an economic analysis. If the project is believed to promote economic growth for a country, then the government tends to accept the project, and as result, it is considered that investment and GDP growth rate are related in a country.

Mushkin (1962), clearly points out that health has a significant effect on the economic growth. It means that health of a worker is the productivity of the worker; hence, spending on health lead to an increase in the human capital. And, this increase also results in increase in the output level.

Ozturk and Topçu (2014) searched for the interaction health expenditures and economic growth. The authors employed a panel data analysis in order to be able to investigate health-growth in G8 countries. Their findings strongly suggest that there exists a one-way causality between health expenditures and economic growth, and health expenditures affect economic growth in the short-run; in contrast, economic growth affects health expenditures in the long-run.

Pradhan (2010) states that the influence of health spending on economic growth in 11 countries, which are Austria, Canada, Finland, Iceland, Ireland, Japan, Norway, Spain, Switzerland, UK and USA, within a panel framework. The analysis is performed for both long-run and short-run between 1961 and 2007. It is founded that increase in health spending leads economic growth to increase as well, and if economic growth raises, health spending also raises. It means that there is reciprocal relationship between these variables.

Schultz (2005) argues that whether poor health has an impact on the total factor productivity, which is also related with the output level of a country. According to this paper, if a person's health is not good enough to work, then, this person drops out from the labor force. It will have ultimate reflections on the economic growth. If people start not work because of their health conditions, there will be a dramatic reduction in the output level, which also shows the strong relationship between health and growth. It can be considered that health is an important indicator for productivity.

Smith (1998) indicated that future income is determined by the health status of the individuals by using life cycle models; the direction of the causality was implied. This paper is also important for my work as it involves the link between health conditions and the future income. If people's health status takes a part in the determination of future income, we can improve these statuses in order to be able to have an economic growth. In this case, future output level can be increased with the developments in health issues as well.

Strauss and Thomas (1998) research indicates that some evidence that is related to productivity and health because according to Strauss and Thomas (1998), there is a strong relationship between health and economic development. In this research, it is stated that there is a strong relationship between labor market and health issues. The crucial point is that economic growth is obtained from the efficiency of healthy individuals.

Sülkü and Caner (2011) made a study about long-run association between per capita GDP, population growth rate and per capita health spending. In the analysis, Johansen multivariate co-integration test is applied for Turkey the period 1984-2006. The findings provide that there is multivariate co-integration among the series of population growth, health expenditure and gross domestic product. In this study, it is concluded that long-term association exists for these variables.

3. Econometric Methodology

$GDP_t = \alpha_1 + \alpha_2 \, hexp_t + \alpha_3 \, investment_t + \mu_t$, where GDP, gross domestic product, stands for the GDP per capita in Turkey for each year, hexp is equal to both public and private health expenditure rate out of GDP and investment indicates investment rate.

It has been chosen gross domestic product per capita as the dependent variable because it has a comprehensive content that can be affected by various issues in a country. Since per capita GDP is one of the fundamental indicators for countries in order to be able to make some analysis for the

countries' status, for instance whether the country has a strong economy or not, or to understand the countries' political policies because politics and economy are strongly related. Therefore, there can be some inferences from examining this issue with regards to politics or the economic activities. I also preferred to employ public and private spending on health as independent variable, and to analyze the interaction between GDP per capita and total health expenditure. Lastly, investment rate out of GDP is used for the analysis in the study.

The data of Turkey's GDP per capita is taken from World Bank, total health spending rate is taken from OECD (1980-2014) and lastly investment rate out of GDP for the period is from Economy Watch (1980-2014). Additionally, the time period of the data is annual.

4. Empirical Results

It is chosen to investigate the links between per capita GDP and health expenditure as it is one of the crucial issues concerning the efficiency of the countries' output level. It is considered that there is an interaction among the variables before making the analysis.

First of all, stationarity or non-stationarity of the variables must be detected by employing unit root test. In time series analysis, identifying stationarity of the data is quite important. Therefore, it is performed 3-unit root tests, which are Augmented Dickey-Fuller (Dickey & Fuller, 1981), Phillips-Perron (Phillips & Perron, 1988) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS, Kwiatkowski, Phillips, Schmidt, & Shin, 1992) to understand the order of integration and also to determine whether the dataset is stationary or not.

The results of the unit root of the data tests are represented in the Table 1 below. In addition, the numbers in the table are t-statistics. I took into consideration the probability values based on the unit root tests at 5% significance level in order to be able to reject or not reject the hypothesis that I established. As a first step of the analysis, I evaluated the Augmented Dickey-Fuller and Phillips-Perron unit root test. These tests have three versions, which are level, first difference and second difference. In addition to them, it contains varied test equations of none, intercept and trend and intercept.

Table 1. Unit root test results

	ADF	ADF	ADF	PP	PP	PP	KPSS	KPSS
	None	Intercept	Trend and Intercept	None	Intercept	Trend and Intercept	Intercept	Trend and Intercept
GDP	1.605538 [0]	0.046977 [0]	-2.016942 [0]	1.627376 (2)	0.057119 (2)	-2.019215 (2)	0.632257 (5)	0.187131 (4)
	-4.993823* [0]	-5.504241* [0]	-5.519957* [0]	-5.109429* (3)	-5.505825* (2)	-5.518941* (1)		
Hexp	1.172671 [0]	-0.602538 [0]	-1.558186 [0]	0.871947 (3)	-0.745014 (3)	-1.935443 (4)	0.618902 (5)	0.104929 (4)
	-4.800511* [0]	-4.959441* [0]	-4.883751* [0]	-4.956281* (4)	-5.074113* (3)	-5.008305* (3)		
Investment	-0.760427 [1]	-3.661386* [0]	-3.866853* [0]	-0.9723466 (7)	-3.661386* (0)	-3.851271* (1)	0.449641 (3)	0.082362 (1)
	-7.661985* [0]			-9.672304* (9)				

Notes: * refers rejection at 5% level of significance. In The Augmented Dickey-Fuller tests, lag length is represented in square brackets. Lag length was chosen based on SIC and maximum lags were set to 9. In Phillips-Perron test, bandwidth is indicated in parenthesis selected accordingly the Bartlett kernel. The null hypothesis of the KPSS test is of non-stationary.

The Augmented Dickey-Fuller Tests and Phillips-Perron Tests hypothesis is following:
H_0: Data series is non-stationary

H_A: Data series is stationary.

This hypothesis indicates a rejection if p-value is less than 0.05, and hence, not rejection if it is greater than 0.05 at 5% level of significance. More importantly, not rejection for the null hypothesis means unit root for the data, and it is non-stationary; in contrast, rejection means no unit root for the data and it is stationary.

Another unit root test is KPSS. The hypothesis for KPSS is the opposite. The hypothesis:

H_0: Data series is stationary.

H_A: Data series is nonstationary.

This hypothesis refers a rejection if p-value is less than 0.05, and therefore, not rejection if it is greater than 0.05 at 5% level of significance. Particularly, not rejection for the null hypothesis means unit root for the data; on the contrary, rejection implies unit root.

In consequence of the unit root tests applied, order of integration for the variables is determined. GDP per capita, public and private healthcare expenditure's unit root test results imply that they are I (1). On the other hand, it can be observed from these tests' results that the order of integration for investment rate out of GDP is equal to I (0).

Non-stationarity is a common issue in time series analysis with regards to empirical results. If the series have unit root, it causes spurious regression, which means that unreliable results are observed from the econometric analysis. Since the series are I(0) are I(1),they are not stationary at the same level , it is very hard to make the analysis using such co-integration tests performed by Engle and Granger (1987), Johansen (1988) and Johansen and Juselius (1990). In other words, these co-integration tests requires that all the series have to become stationary when their differences are taken at the same level. In addition, it is not possible to investigate the co-integration if any of the series are I (0). However, this problem can be solved by using bounding test developed by Pesaran, Shin and Smith (2001). This model is applied for the series that are co-integrated at different levels. The presence of the co-integration can be detected although the series include both I(0) and I(1). In addition, it examines the relation between dependent variable and independent variables in both short term and long term. It is possible for ARDL models to estimate short and long term parameters together, and to provide the series being different lag lengths (Pesaran et al., 2001). ARDL, autoregressive distributed lag, bounds testing approach of co-integration consists of two parts, which are limit testing and generation and estimation of long and short-term parameters. When this method is used, it is determined that whether there is a long-term relationship among the variables. In order to be able to examine the long-run association between the variables, bound testing is applied. If the existence of long-run relationship is detected, then, the second part is performed.

Firstly, boundary test is employed, and if the t-statistic takes a value above the upper critical value, coefficients are presumed for the series. When this test is performed, unrestricted error correction model (UECM) is constructed. The model for this study is as follows

$$\Delta GDP_t = \alpha_0 + \alpha_1 t + \sum_{i=1}^{m} \alpha_{2i} \Delta GDP_{t-I} + \sum_{I=0}^{m} \alpha_{3i} \Delta hexp + \sum_{I=0}^{m} \alpha_{4i} \text{ investment} + \alpha_5 GDP_{t-1} + \alpha_6 hexp_{t-1} + \alpha_7 \text{ investment}_{t-1} + \mu_t$$, where t is trend variable, m is lag length.

In this model, the null hypothesis is that there is no co-integration between dependent and independent variables; on the contrary, the alternative hypothesis is that there is co-integration between them.

H_0: $\alpha_5 = \alpha_6 = \alpha_7 = 0$

H_1: $\alpha_5 \neq \alpha_6 \neq \alpha_7 \neq 0$

The results of the boundary test is represented in Table 2.

Table 2. Results of bound test

k	F statistics	%5 critical values	
		Lower bound	Upper bound
2	6.049002	3.79	4.85

The critical values are obtained from the Table CI(V) of Pesaran et al. (2001, p. 300), and k indicates the number of independent variables in the equation of Unrestricted Error Correction Model (UECM). On the basis of bound test results, it can be stated that there is a co-integration relation

between the series since the value of calculated F-statistic is greater than the upper limit critical value. When F-statistic has a greater value than upper bound critical value, the null hypothesis can be rejected and it means that the presence of co-integration between the series is determined. Thus, ARDL model can be constructed to analyse the long-term interaction between the variables.

ARDL model for the series as follows:

$$GDP_t = \alpha_0 + \alpha_1 t + \sum_{l=1}^{m} \alpha_{2i} GDP_{t-i} + \sum_{i=0}^{n} \alpha_{3i} hexp + \sum_{i=0}^{l} \alpha_{4i} investment + \mu_t$$

Table 3. ARDL (1,1,4) Estimation results

Variables	coefficients	t statistics	P value
GDP(-1)	0.776500	11.00418	0.0000
Investment	226.5981	4.762238	0.0001
Investment(-1)	-77.12694	-1.413411	0.1715
hexp	209.2081	0.597684	0.5562
hexp(-1)	383.2896	0.783519	0.4417
hexp(-2)	-537.4327	-1.194484	0.2450
hexp(-3)	-8.626759	-0.019283	0.9848
hexp(-4)	778.1883	2.086863	0.0487
C	-4667.995	-2.808407	0.0102

The long-term coefficients calculated by the estimation results of ARDL (1,1,4) model is represented in Table 4 below.

Table 4. Long-run coefficients
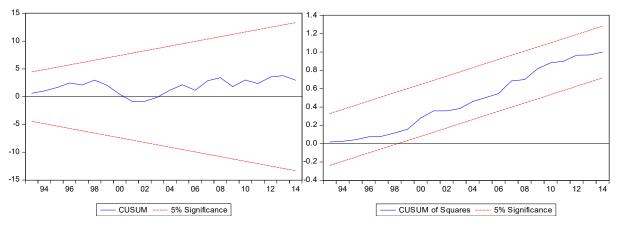
Variables	coefficients	t statistics	P value
Investment	668.774884	2.505391	0.0201
hexp	3689.605761	7.540314	0.0000
C	-20885.89342	-3.110961	0.0051

The results in the table indicates that there is a meaningful relationship between GDP per capita, public and private healthcare spending and investment in the long-run. The coefficients of investment and total health expenditure are positive and statistically significant.

Also, the stability of long term coefficients is examined for structural change by using the Cumulative Sum (CUSUM) tests, which is a general test developed by Brown, Durbin and Evans (1975).

Figure 1. Plot of CUSUM tests for the parameters stability of the equation

The figure implies the CUSUM test statistics' plot that takes place in the critical bounds of 5% significance level. Based on this figure, it can be concluded that the parameters estimated by the model are stable from 1980 to 2015.

5. Conclusion

To sum up, this paper examined whether there is any connection between per capita GDP and total spending on health in Turkey from 1980 to 2015. When the unit root tests are employed, it is observed that the series become stationary at different levels.

Total healthcare expenditure and GDP per capita are I(1); however, investment rate out of GDP is I(0). Therefore, it is preferred to perform bound testing approach developed by Pesaran et al. (2001) in order to be able to analyse the interaction between variables. After detecting the existence of co-integration, ARDL model is applied. In the long-run, there is a positive relationship between GDP per capita, public and private spending for health and investment. If the stability of the long-run coefficients of the variables is checked, the model forecasted stable parameters over the period 1980 to 2015.

Furthermore, it can be considered that investment and total health expenditure have remarkable effects on per capita GDP. In other words, health and investment affect GDP per capita in a positive way since the productivity of the country is improved.

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