The Relationship between public spending on health and economic growth in Algeria: Testing for Co-integration and Causality

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Abstract

This paper investigated the causality and co-integration relationships between public spending on health and economic growth in Algeria during 1974-2014 using annual data. This paper concentrated on time series co-integration and causality in ECM framework. The findings revealed that there is a long-run causality from public spending on health to economic growth while it is not observed any short-run causality from public spending on health to economic growth. The lack of strong link from public spending on health to economic growth is not necessarily a reason to reallocate health investment away from the health sector. The improvements in health status will be worth the effort even if they turn out to have little effect on growth.

Key words: public spending on health, Economic Growth, Co-integration, Causality.

JEL classification: I18 I15 C10

INTRODUCTION:

The policies for better health, poverty reduction, and less inequality throughout the world require thorough understanding of both the processes and causal paths that underlie the intricate relationship between health and income. This is deemed difficult, contingent and only partially understood.**(** *Muhammad Jami Husain(2009); p:01***)**.

Everyone knows importance of health as a basic right for life. According to Amartyasen health is a kind of empowerment that gives value to human life. It will be leaded to individual growth capacity and economic security for the individuals and families (*Asefzade(2008), p: 34).*

In all developing economies since the 1960s, there has been considerable concern about the increasing proportion of *GDP* devoted to health care spending. As a result, much research has focused on the identification of the factors that contribute to increases in health care spending. The factor that has been identified as the most influential is real *GDP* (*Syed Adnan Haider,2007, p:126).*

There are a number of possible reasons for a positive relationship between *GDP*, and the amount spent on health care. First, increased income means that there is more money to spend on health both in the public and private sectors. Second, more health spending may lead to better health status, which may in turn cause higher income. Healthier workers are more productive and hence the economy as well as individuals have more income. This implies that the causal relationship between health expenditure and *GDP* may run in either or both directions. (*Syed Adnan Haider,2007, p:126).*

In order to explain the relationship between health and economic growth, it is necessary to understand the concept of health in a broad sense. Health is not only the absence of illnesses; it is also the ability of people to develop to their potential during their entire lives. In that sense, health is an asset individuals possess, which has intrinsic value (being healthy is a very important source of well-being) as well as instrumental value. In instrumental terms, health impacts economic growth in a number of ways

As we know health can affect production level of a country through various channels. The first channel that its impact has been referred in most studies is better efficiency of healthy employees comparing with others. Healthy employees work better and more than others and have a creative and more prepared mind. Beside this direct impact health has indirect impacts on production as well for instance health improvement in the human force will be followed by motivation to continue education and obtain better skills, since improvement of health conditions will increase investment attraction in education and educational opportunities from one side and will prepare the individuals to continue education and obtain more skills by enhancement of learning capability from the other side. Similarly, enhancement of health and health indexes in the society will encourage individuals towards more saving through reduction of mortality and increasing of life expectancy. Following increased saving in the society physical capital is enhanced and this issue will be effective indirectly on labor force productivity and economic growth ***(*** *Kambiz Peykarjou et al(2011),p:104****)***.

health expenditures and real gross domestic product in each country have mutual relationship based on theoretical principles and experimental observations and studying the impact of each of these two variables on the other variable won't be so valid without considering their mutual impact in terms of econometrics methods (*Beheshti and Sajoudi, 2008, p: 116)* .

Literature review:

Public expenditure review on health sector is a continuous process of analysis that helps to make fiscal management, macroeconomic and social stability in the country from the health perspective,(*Nepal Health Economics AssociationKathmandu, 2009*).

The human resources play a priority role for a bearable economic growth. The theories of economic growth suggest the role of the human resources as significant for the process of growth. In economic literature, the concept of human resources was defined by including the education and the other investments which increase the productivity of an individual. However, the economists of

growth who incorporated human resources into the economic growth pay a bigger attention to analyze him of the impact of the education on the economic growth, whereas they ignore the role of the human resources of health.(*Mekdem Majdi, 2012, p:175)*

Wagner (1883) postulated that, when the per capita income of a country increased, the Government would raise public spending. This is popularly known as Wagner's law, under which GDP growth causes a rise in public spending and in such a case an unidirectional causality runs from GDP growth to public expenditure. Empirical findings in this regard, however, are inconclusive in the countries concerned. According to Barro (1991), investment expenditure, especially in State-owned production, contributes positively to economic growth. On the other hand, government consumption spending has growth-retarding effects, but the problems relate to the categorization of expenditures under two broad forms of consumption and investment headings in empirical investigations *(Biswajit Maitra and C.K. Mukhopadhyay2012,p:22)*

It is only last decade that there is a flurry of studies exploring the relationship between health and economic growth. Sachs and Warner (1997) by using life expectancy as indicator of health s finds a quadratic relationship between health human capital and the rate of economic growth. Study concludes that health human capital increases economic growth at a decreasing rate. By using data of mortality rate Fogel (1994) concludes that approximately one third of income growth in Britain during 1790-1980 may credited to improvements in health facilities and better nutrition. Study also concludes that public health and medical care must be recognised as labour-enhancing technological change. While taking into account initial poverty, economic policy, tropical location, and life expectancy Gallup and Sachs (2000) find that per capita GDP of the countries having intensive prevalence of malaria grew 1.3% less compared with other countries. Study also concludes that a 10% reduction in malaria incidence would result in 0.3 percentage increase in the growth rate of per capita GDP. By using different household survey indicators of adult nutrition and health, Schultz (2005) examines the impact of health on total factor productivity. Study finds that better health human capital have a significant and positive impact on wages and workers productivity. Study finds the developing countries often lack the resources for investment in health; on the other hand poor health status slows down the economic growth. Developing countries seems to be in a vicious cycle resulting in persistent underdevelopment.

Theoretical literature suggests that could be a two way relationship between health and income. The effect of economic growth on health is well known. by definition, health expenditure is a function of income or resources available both in private and public sectors. Higher income implies that there is more money to spend on health. A large body of research within health economics Indicate that variation in per capita health care expenditure could be mostly explained by variations in per capita GDP (Gerdtham and Jonsson, 2000). On the other hand, a reverse causation from health expenditure to income has also a theoretical basis. Health is a capital and hence investment on health is a important source for economic growth. the report of the WHO's Commission on Macroeconomics and Health (2001), states that "extending the coverage of crucial health services….to the world's poor could save millions of lives each year, reduce poverty, spur economic development and promote global security." (World Health Organization, 2001). Theoretically, health is a determinant of human capital, and labor productivity. So, regarding health expenditure as an investment in human capital and accordingly the engine of growth, an increase in health expenditure is expected to lead to higher income. In addition, rises in health expenditure possibly increase labor supply and productivity, which eventually must lead to a higher income (e.g., Muysken, Yetkiner, and Ziesemer, 2003). Finally, there may be some intermediate variable which causes both better health and higher income. for example, more education increase health and income for households. *(Mohsen Mehrara& Maysam musai ,p:104)*

The role of health care spending on stimulating economic growth has been suggested by Mushkin *(Mushkin, S.J., 1962).* This is known as the health-led growth hypothesis. According to this hypothesis, health is a capital, thus investment on health can increase income, hence lead to

overall economic growth. In fact, health can affect economic growth through its impact on human and physical capital accumulation (Chor Foon TANG,2010,p:01).

Cole and Neumayer (2006) found that poor health can reduce aggregate productivity, thus poor health appear to be a key factor in explaining the existence of underdevelopment in many regions of the world. Therefore, the question of whether or not health spending could stimulate economic growth has become a vital empirical issue. During the past decades, there have been many studies of the relationship between health spending and economic growth. However, these research efforts failed to produce clear evidence of the direction of causality. Hence, the causality relationship remains ambiguous thus far (Chor Foon TANG,2010,p:01).

The relationship between health and economic growth has been empirically investigated intensely, although, the evidence is mixed. Moreover, most of empirical studies have focused on developed countries by using a panel data analysis For example; Devlin and Hansen (2001) examined Granger causality between health expenditure and GDP and showed some (mixed) evidence that indeed there might be bi-directional (Granger) causality between health spending and income. Haider ali shah bukhari, and and Sabihuddin butt (2007) support for the existence of a long run relationship between GDP and health expenditure and the exogeneity of GDP in Pakistan. Hartwig(2010) revisits the question whether health capital formation stimulates GDP growth in rich countries applying the panel Granger-causality framework. His results do not lend support to the view that health capital formation fosters long-term economic growth in the OECD area. *(Mohsen Mehrara& Maysam musai ,p:104)*

BERTA .R &LUIS .C(2003) analyzed the effect of health investment on productivity as an important variable associated with human capital accumulation. The authors also study the possible existence of endogeneity by using instrumental variables estimation. The results that are obtained may be interpreted as evidence of the positive impact of health expenditure on income growth. Furthermore, the authors looked at the bounded gains of health status and divided the sample according to the median of total health expenditure and found that the countries with lower levels of health spending obtain larger benefits when the other determinants of growth are held constant.

JOHN C. ANYANWU et al, 2007 provides econometric evidence linking African countries' per capita total as well as government health expenditures and per capita income to two health outcomes: infant mortality and under-five mortality. This relationship is examined, using data from 47 African countries between 1999 and 2004. Health expenditures have a statistically significant effect on infant mortality and under-five mortality. The magnitude of our elasticity estimates are in consonance to those reported in the literature. For African countries, their results imply that total health expenditures (as well as the public component) are certainly important contributor to health outcomes. In addition, we find that both infant and under-five mortality are positively and significantly associated with Sub-Saharan Africa. The reverse is true for North Africa. While ethnolinguistic fractionalization and HIV prevalence positively and significantly affect the health outcomes, higher numbers physicians and female literacy significantly reduce these health outcomes. These results have important implications for attaining the targets envisioned by the Millennium Development Goals.

*Muhammad Akram et al(2007)*carried out to measure the incidence of government spending on health in Pakistan at provincial, both rural and urban level; using the primary data of the Pakistan Social Standard Living Measures Survey (PSLM), 2004-05, and by employing the three-step Benefit Incidence Approach (BIA) methodology. The paper reviews the national policies emphasising health services as well as the trend in access to and public sector spending on health care facilities in Pakistan. The study explores the inequalities in resource distribution and service provision against the government health expenditures. The rural areas of Pakistan are the more disadvantaged in the provision of the health care facilities. The expenditures in health sectors are overall regressive in rural Pakistan as well as at provincial and regional levels. Mother and Child subhead is regressive in Punjab and General Hospitals and Clinics are regressive in all provinces. Only the Preventive Measures and health facilities sub-sector is progressive in Pakistan. Public health expenditures are pro-rich in Pakistan.

Beheshti and Sojoudi (2008) studied the long-term relationship between health expenditures of the government and gross domestic product in Iran during the period 1960-2005 and income tension of health expenditures. Results of Bond test and Johansson's convergence (1991) illustrate that there is only one long-term relationship between health expenditures of the government and gross domestic product which has had a positive and significant impact on government's health expenditures. Similarly, amount of income tension of health expenditures has been close to one and these expenditures are of essential expenditures type.

Chor Foon TANG (2010) employed the Granger causality test within a multivariate cointegration and error-correction framework to investigate the relationship between health spending, income, and health price in Malaysia. This study covers the annual sample from 1970 to 2009. The main findings of this study are that in the short-run there is uni-directional Granger causality running from health spending and health price to income in Malaysia. While, in the long-run health spending, income and health price are bi-directional Granger causality. In addition, they also extend the study to examine the dynamic interaction between the variables in the system through the forecast error variance decomposition and impulse response function analyses. In line with the finding of Granger causality, all the variables behaved endogenously in the long-run. Thus, the variables are Granger-causes each other in the long-run even there might be deviations in the short-run.

Kambiz Peykarjou et al(2011) evaluated the relationship between health and economic growth in Organization Islamic Conference member states by means of time series data during the years 2001-2009 given to other effective factors on the economic growth such as life expectancy, fertility rate and etc through a data panel model (panel data) in the framework of a Semi log regression model. Obtained results reveal that increased life expectancy is leaded to enhance economic growth in these countries. Also there is a negative relationship between fertility rate and economic growth in the above sections.

Bakare A.S and Olubokun Sanmi (2011) studied the relationship between health care expenditures and economic growth in Nigeria. The ordinary least square multiple regression analytical method was used to examine the relationship between health care expenditures and economic growth. The data analysis showed a significant and positive relationship between health care expenditures and economic. The study thus recommended that Nigerian policy makers should pay closer attention to the health sector by increasing its yearly budgetary allocation to the sector. Nevertheless the key to good results lies not in ordinarily increasing particular budgetary allocation but rather in implementing a public finance system that, to the extent possible, links specific expenditure and revenue decisions and ensure the usage of the allocated fund as transparently as possible.

Mohsen Mehrara& Maysam musai (2011) Examined the causal relationship between the health expenditure and the GDP in a panel of 11 selected oil exporting countries by using panel unit root tests and panel cointegration analysis. A three variable model is formulated with oil revenues as the third variable. The results show a strong causality from oil revenues and economic growth to health expenditure in the oil exporting countries. Yet, health spending does not have any significant effects on GDP in short- and long-run. The findings imply high vulnerability of oil dependent countries to oil revenues volatility. To insulate the economy from oil revenue volatility requires institutional mechanisms de-linking health expenditures decisions from current revenue.

Mostafizur Rahman (2011), investigated the causal relationship among health expenditure, education expenditure and GDP for Bangladesh. First he presented the extension form of the augmented Solow Growth model by including education expenditure and health expenditure as education and health capital. In his empirical study we used time series data for the period 1990 to 2009. From the ECM methodology we found that an including of health and education expenditure as an investment in health and education capital improve the significance of the coefficient of human and physical capital in the growth model for Bangladesh. Secondly, he find out the causal relationship among these variables by Var Granger Causality test. From the empirical study he

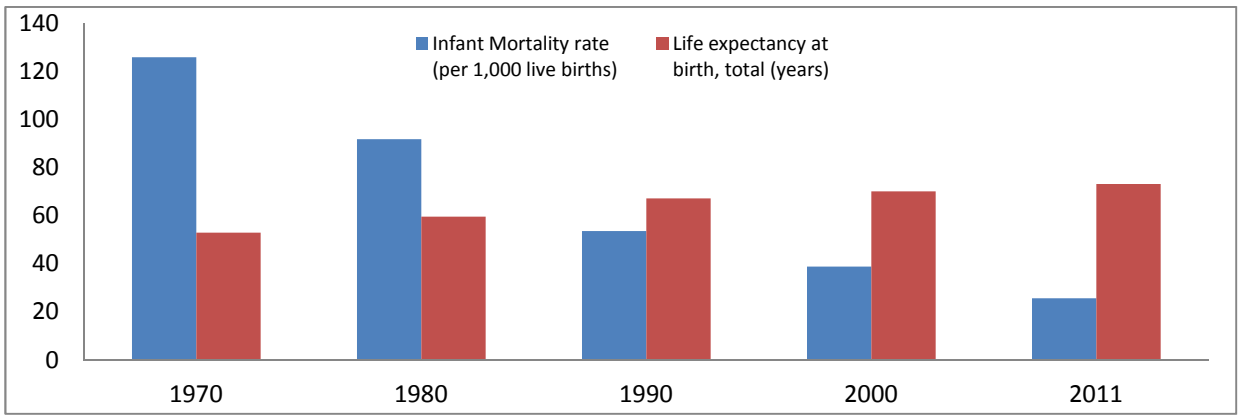
found the existence of bidirectional causality from education expenditure to GDP and also from education expenditure to health expenditure and only unidirectional causality is obtained from health expenditure to GDP. This paper will provide a significant policy guideline to the policy maker.

Biswajit Maitra and C.K. Mukhopadhyay(2012) examined the role of public spending on the education and health sectors is examined with regard to promoting the gross domestic product (GDP) of 12 countries in Asia and the Pacific over the last three decades. In six of those countries, namely Bangladesh, Kiribati, Malaysia, Maldives, the Philippines and the Republic of Korea, Johansen cointegration tests confirmed the existence of cointegrating relations. In the remaining countries, namely Fiji, Nepal, Singapore, Sri Lanka, Tonga and Vanuatu, cointegrating relations were absent. The causal impact of education and health-care spending on GDP was further examined in the study. Education spending was found to have raised GDP in Bangladesh, Fiji, Kiribati, Maldives, Nepal, Singapore, Sri Lanka, Tonga and Vanuatu. On the other hand, health-care spending contributed to GDP growth in Bangladesh, Nepal, the Philippines, Singapore and Sri Lanka. In the Philippines spending on education had a negative impact on GDP, while in Kiribati, Maldives and Vanuatu, the impact of health-care spending on GDP was found to be negative. In the case of Malaysia and the Republic of Korea, neither education spending nor health-care spending exhibited an appreciable impact on GDP. It was also found that the gestation lag of education spending was longer than that of health-care spending.

Z. Mila Elmi and S. Sadeghi(2012) studied the causality and co-integration relationships between economic growth and health care expenditures in developing countries during 1990-2009. The findings revealed that there is a short-run causality from GDP to health care spending, while it is not observed any short-run causality from health spending to economic growth. Likewise, there is a bilateral causality and long-run relationship between economic growth and health spending. In other words, the findings indicated that income is an important factor across developing countries in the level and growth of health care expenditure, in long-run. As well, the health-led growth hypothesis in developing countries is confirmed.

In January 2000, the Commission on Macroeconomics and Health was established by World Health Organization to assess the place of health in global economic development in the realm of the health related Millennium Development Goals. The Commission made strong recommendations to promote health sector investments asserting that extending the coverage of crucial health services, including a relatively small number of specific interventions, to the world's poor could save millions of lives each year, and would translate into hundreds of billions of dollars per year of increased income in the low-income countries. In this respect, quantification of health's contribution will highlight the importance of investing in health in installing a virtuous cycle of economic development, which until now has been much less appreciated. (*Muhammad Jami Husain(2009);p:27)*.

Figure 1: **Health Indicators in Algeria**



Source: World Development Indicator, 2014.

The relationship between health and economic growth has been empirically investigated intensely, although, the evidence is mixed. Moreover, most of empirical studies have focused on developed countries by using a panel data. Therefore, a country-specific study on developing countries such as **Algeria** is relatively scarce. Hence, Purpose of this paper is to analyse the long-term relationship between health expenditure and per capita GDP in Algeria, by using Co-integration and Granger Causality, Long-term analysis of health and economic growth would be very helpful in determining the possible magnitudes of fully accumulated effects of health on economic growth. Two main hypotheses would be tested; firstly, hypothesis that 'health affects economic growth' is a long run phenomenon would be tested. Secondly, whether, there exists a two-way causality or causality is unidirectional between public spending on health and per capita GDP.

Methodology and Data propositions:

In this section we use the Granger causality to study the causal relationship between public spending on health and per capita GDP in Algeria, per capita GDP is used as a proxy for economic growth. The macroeconomic variables used in the analysis are: public spending on health (PSH) and per capita GDP. Data used in the analysis are annual time series during the period 1974-2014 on (logarithm of) public spending on health (PSH) in national currency and per capita GDP in National currency, reflecting data availability. The data on per capita GDP is taken from (IMF)International Monetary Fund Indicators, World Economic Outlook Database, October 2013 (IMF) 2014, values of GDP(2013-2014) indicate IMF staff estimates**,** and The data on public spending on health are expressed as a total government health expenditure.

The causality test relationship between health expenditure and GDP requires three steps. **First,** the time series would be analyzed in order to determine the order of integration. **Second**, investigating the long run equilibrium relationship between public health expenditure and GDP. **Finally,** the short run as well as the long run causality relationship between health expenditure and GDP would be investigated.

1- Unit Root Test

Most of time series have unit root as many studies indicated including (Nelson and Polsser, *1982),* and as proved by (Stock and Watson, 1988,p) and (Campbell and Perron, 1991) among others that most of the time series are non-stationary. The presence of a unit root in any time series means that the mean and variance are not independent of time.

Conventional regression techniques based on non-stationary time series produce spurious regression and statistics may simply indicate only correlated trends rather than a true relationship (Granger and Newbold, 1974). Spurious regression can be detected in regression model by low Durbin-Watson statistics and relatively moderate R2. One of the most widely used unit root test is

the Augmented Dickey-Fuller (ADF) unit root test (Dickey and Fuller, 1979, 1981). Alternatively, (Phillips, 1987) and (Phillips and Perron, 1988) (PP) have proposed a nonparametric method to correct a wide variety of serial correlation and heteroskedasticity. (Perron, 1989, 1990) demonstrates that if a time series exhibits stationary fluctuations around a trend or a level containing a structural break, then unit root tests will erroneously conclude that there is a unit root. Phillips-Perron and Dickey-Fuller tests have the same asymptotic distributions.

The unit root test and the order of the integration would be preformed on both the original series and the differences of the series using the PP and ADF test.

2- Cointegration Test

The non-stationary series with the same order of integration may be cointegrated if there exist some linear combination of the series that can be tested for stationarity. Cointegration is a test of long run equilibrium of non-stationary series that do not have equilibrium relationship in the short run (Granger and Newbold, 1974, 1977). (Engle and Granger, 1987) propose a two steps procedure to test cointegration between two time series, First, cointegration regression: $\boldsymbol{Xt = a + bYt + Ut}$ is estimated by OLS, then the residuals from the regression are tested for stationarity. If the test indicates that the residuals are stationary, i.e. I(0), then there is a Cointegration between Xt and Yt, *i.e.* they have a long run equilibrium relationship. Moreover, the existence of Cointegration between two time series indicates the existence of a causality relationship at least in one direction (Granger, 1988). However, Engle-Granger procedure is considered appropriate for two time series with large sample sizes.

Alternatively, the Johansen and Juselius procedure (Johansen, 1988), (Johansen and Juselius, 1990) is preferable to test for Cointegration for more than two series. Moreover, Johansen and Juselius procedure is considered better than Engle-Granger even in two time series case and has better small sample properties since it allows feedback effects among the variables under investigation where it is assumed in the Engle-Granger procedure that there are no feedback effects between the variables. The procedure is based on likelihood ratio (LR) test to determine the number of Cointegration vectors in the regression. Johansen technique enables to test for the existence of non-unique Cointegration relationships. Two tests statistics are suggested to determine the number of Cointegration vectors based on likelihood ratio test (LR): the trace test and maximum eigenvalues test statistics(*Khalid H. A. AL-Quadair,2005,p:35).*

Which test the null hypothesis that the number of Cointegration vectors = r against the alternative that there are r+1 cointegrating vectors, the null hypothesis, r = 0 is tested against the alternative that r = 1, and r = 0 is tested against the alternative r = 2, when the two tests Produced conflicting results, the maximum eignvalues test is considered since the alternative hypothesis is an equality.

3- Error Correction Model and Causality Tests

Having established the long run equilibrium relationship between public spending on health and per capita GDP, the short run adjustments are estimated using the error correction model (ECM).

The short run causality is based on a standard F-test statistics to test jointly the significance of the coefficients of the explanatory variable in their first differences. The long run causality is based on a standard t-test. Negative and statistically significant values of the coefficients of the error correction terms indicate the existence of long run causality.

4- Granger Causality:

Granger Causality test helps in determining the direction of causal relationship between different variables. To test the causality relationships following model is used.

$$GDP_t = \sum_{i=1}^{n} aihealth_{t-i} + \sum_{j=1}^{n} B_j GDP_{t-j} + U_{1t}$$

$$health_t = \sum_{i=1}^{n} \lambda_i health_{t-i} + \sum_{j=1}^{n} \delta_j GDP_{t-j} + U_{2t}$$

Where U_{1t} and U_{2t} are two white noise series and k is maximum number of lags. Granger causality is very sensitive with number of lags used. Four findings are possible in Granger Causality

test a) Neither variable 'Granger Causes' other b) Unidirectional Causality from x to y but not vise versa C) Unidirectional Causality from y to x but not vise versa d) Both variables cause each other. The existence of cointegrating relationship between PSH and GDP for Algeria suggests that there must be long run Granger causality in at least one direction (Hatanaka, 1996). In this section, we test for Granger Causality between log of real public spending on health (PSH) and log of real per capita(GDP). Cointegration implies that causality exists between the two series but it does not indicate the direction of the causal relationship. The dynamic Granger causality can be captured from the vector error correction model (VECM) derived from the long-run cointegrating relationship (Granger 1988).

Analysis and Findings:

1- Graphes:

Figure 2: Proportion of government development expenditure on health (percent) And GDP in Algeria during (1974-2014)

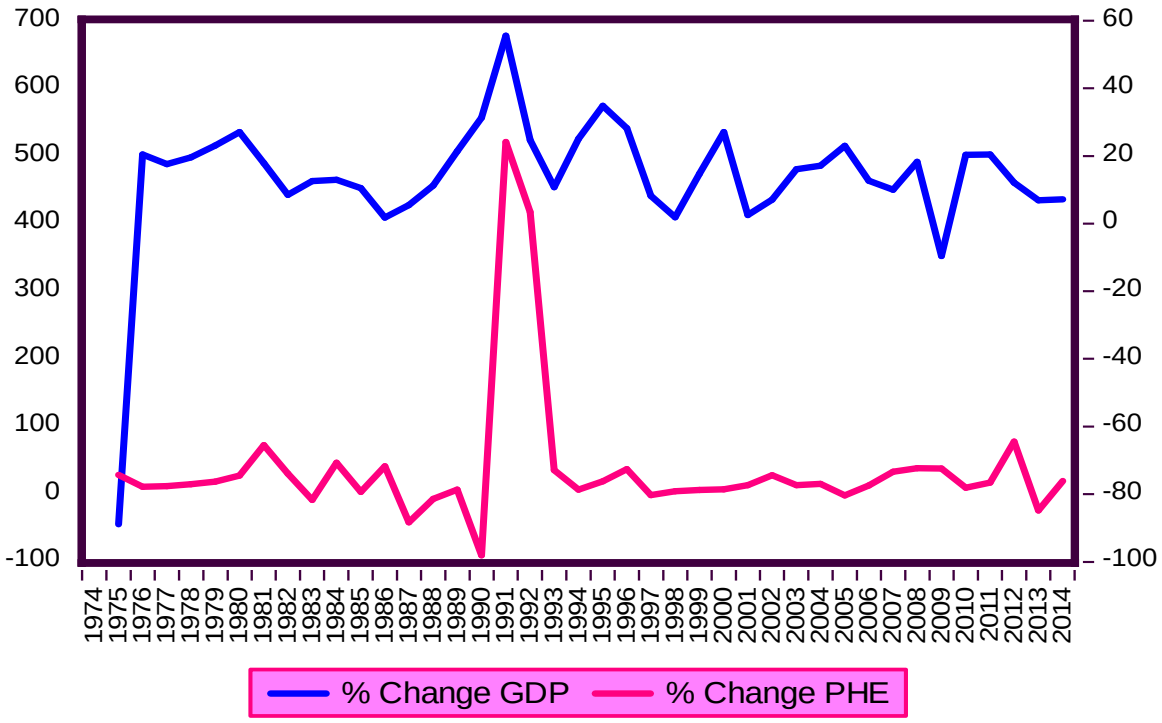


Figure 2 shows the expenditure on health as a proportion of total government development expenditure in Algeria for the period 1974 to 2014. It is evident that expenditure increased steadily during the period.

2- Properties of the Time Series

The first step in constructing the co-integration model and testing the Granger causality relationship is to test the stationarity of the series over time and to determine the degree of integration based on the Phillips and Perron unit root test (PP) and ADF Unit Root Test.

TABLE 1: Results of PP Unit Root Test.

Name of Variable	Level			1st Difference		
	Intercept	Trend and Intercept	**None**	**Intercept**	Trend and Intercept	**None**
Per Capita GDP	12.05	7.12	10.85	-4.08	-6.51	-2.95
Health Expenditure	2.67	0.25	3.70	-8.17	-9.94	-7.73

Critical values:	Intercept	Intercept and Trend	No
At (1%) level of Significance	-3.62	-4.22	-2.63
At (5%) level of significance	-2.94	-3.53	-1.95
At (10%) level of significance	-2.61	-3.20	-1.62

TABLE 2: Results of ADF Unit Root Test.

Name of Variable	Level			1st Difference		
	Intercept	**Trend**	**None**	**Intercept**	**Trend**	**None**
Per Capita GDP	5.63	1.26	7.84	-3.95	-6.48	-1.58
Health Expenditure	2.62	0.7	3.46	-8.54	-9.92	-7.87

Critical values:	Intercept	Intercept and Trend	No
At (1%) level of Significance	-3.62	-4.22	-2.63
At (5%) level of significance	-2.94	-3.53	-1.95
At (10%) level of significance	-2.61	-3.20	-1.62

The analysis of time series showed that the time series of public spending on health and gross domestic product are not stationary at their levels at the **(1%) (5%) (10%)** level of significance. However, the series are stationary at their first differences, which indicates that the series are integrated of degree one (I (1)).

3- Cointegration:

There are four different steps involved while testing co-integration, in the first step order of stationarity is determined and variable must be stationary at same level. We have already found that variables are stationary at first difference i.e. series of the model are I (1). Therefore, the co-integration can be determined between the variables. Second step involves choosing the optimal lag length. To determine the lag length VAR model is used. According to AIC criteria, we determine the lag length of one for the model. Next step deals with determining the number of cointegrating vectors. In the study, both trace statistic and eigenvalue statistic are used. The results of both of the statistics are summarised in table 03 and table 04.

TABLE 3:Unrestricted Cointegration Rank Test (Trace):

Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.451213	25.31692	12.32090	0.0002
At most 1 *	0.047920	1.915161	4.129906	0.1959

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

TABLE 4: Unrestricted Co-integration Rank Test (Maximum Eigenvalue):

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.451213	23.40176	11.22480	0.0003
At most 1 *	0.047920	1.915161	4.129906	0.1959

Max-eigen value test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Results of trace static suggest that there exist one cointegrating vectors, also the results of maximum Eigenvalue value suggest the one cointegrating vectors.

TABLE 5: Normalized Co-integrating Coefficients:

Variable	Coefficient	Std. Error	t-Statistic	prob
PHE	0.0000552	0.00000258	21.41615	0.0000
R-squared	0.869532			
Adjusted R-squared	0.869532			
S.E. of regression	1936.538			
Sum squared resid	150000000			
Log likelihood	-367.9852			

Empirical evidence presented in table 5 reveals that in the long run public spending on health is positively and significantly affects per capita GDP

4- Error Correction Model:

If there a long run relationship between different variables exists then an error correction process is also taking place. Error correction model indicates the speed of adjustment towards the long run equilibrium after a short run shock. In order to check error correction following equation is estimated:

D(GDP) = C(1)*(GDP(-1) - 2.04980590382e-05*HE(-1)) + C(2)*D(GDP(-1)) + C(3)*D(HE(-1))

TABLE 6: Error Correction model estimation

Variable	Coefficient	Std.Error	t-Statistic	Probability
ECT(-1)	-0.684316	0.139253	-4.914189	0.0001
R-squared 0.953142		Mean dependent var 557.8715		
Adjusted R-squared 0.911796		S.D. dependent var 722.1763		
S.E. of regression 214.4800		Durbin-Watson stat 2.197571		
Sum squared resid 782028.3		Log likelihood -213.0318		

The estimated results shows that estimated lagged error correction term is negative and significant, suggesting that error correction is happening in the model. The coefficient of feedback coefficient (Error Correction term) is -0.68, suggesting that approximately 68 % of disequilibrium in previous year is corrected in the current year. Alternatively, it takes approximately 7 years for any deviation from the long run relationship between health expenditure and GDP to be corrected after a change in health expenditure.

5- Granger causality:

Table 7 presents the results of the short run Granger causality test based on a standard F-test statistics that tests jointly the significance of the coefficients of the explanatory variables in their first differences.

TABLE 7: Results of Granger Causality Test

Null Hypothesis	F Statistic	Probability	Direction of Causality
GDP does not Granger Cause health expenditure	20.3756	0.00006	**GDP→health expenditure**
health expenditure does not Granger Cause GDP	0.13881	0.7116	

results indicates that there exists a unidirectional casual relationship and per capita GDP causes public spending on health. These results reveal that the public spending on health a major health input variable does not cause per capita GDP.

This result confirms the poor allocation and utilization of public spending on health. The results coincide with: Beheshti and Sojoudi (2008), Chor Foon TANG(2010), Mohsen Mehrara& Maysam musai (2011), that there is a unidirectional casual relationship between economic growth and health spending. However, the results are in contrast with: Berta Rivera And Luis Currais (2003) Mila Elmi and S. Sadeghi (2012), Bakare A.S and Olubokun Sanmi(2011), Mostafizur Rahman (2011), who found that there is a bilateral causality and long-run relationship between economic growth and public spending on health.

Conclusion:

In this paper, an attempt was made to find the direction of the causal relationship between public spending on health and economic growth in Algeria using co-integration technique and the direction of causality in both long and short run through integrating the Error Correction Model into the traditional Granger causality test**.**

Data properties were analyzed to determine their stationarity using the PP ana ADF unit root tests which indicated that the series are I(1). The results of the cointegration based on Johansen technique indicate that there is a long run equilibrium relationship between health expenditure and gross domestic product; although, they may be in disequilibrium in the short run.

Our results support the existence of a long run relationship between GDP and public spending on health, The main results in this paper confirm that there is unidirectional causal link running from GDP to public spending on health. Yet, public spending on health does not Granger-cause per-capita GDP growth with a positive sign. so, study points out a rather diminutive role of public spending on health in determining the per capita GDP, Specially That Government of Algeria depends on its oil revenues that fluctuate over time which in turn affect the public spending on health and the growth of the economy.

The lack of strong link from public spending on health to economic growth is not necessarily a reason to reallocate health investment away from the health sector. The policy implications of the study is that countries that desire a high levels of per capita income, they can achieve it by increasing and improving the stock of health human capital, specially if current stocks are at lower end.

In other words, the findings indicated that income is an important factor across developing countries in the level and growth of public spending on health in long-run. As well, the health-led growth hypothesis in Algeria is not confirmed.

Developing countries (Algeria) will also need to make a number of value decisions before deciding what course is appropriate for their population health goals. Firstly they need to decide the extent to which they see health as an end in itself, or as a means to economic growth. This will inform their willingness to sacrifice economic goals for health goals. Secondly they need to decide what weighting they give to the health of their poorest people. This will then direct a relevant amount of their health and growth policies towards reducing the poverty and disease burden amongst these groups, even at the expense of average health and growth. Thirdly they need to

research the inequalities in their own country. This will assist them in creating poverty reducing growth policies, and inform their population health aims. Fourthly, and perhaps most importantly, they need to renew strong public commitment to widespread distribution of health knowledge and services. This includes state political support and also the facilitation of public participation in demanding better health. This may, in the end, be of more importance than growth itself.

Utilization of allocated resources in the health sector may depend largely on good governance and efficient institutions, and skilled manpower of the country. In order to reap all the benefits of such spending, the authority should ensure a supportive and efficient socioeconomic structure for efficient utilization of resources. Particularly, in the case of Algeria, it may be a difficult task to utilize such resources in the face of some practical constraints, such as inappropriate planning faltering monitoring and skilled manpower, widespread corruption and administrative bottlenecks.

In such a situation, inclusion of some potential variables, such as good governance and democracy, may provide insights about the efficacy of such spending on economic growth.

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