Causality between Public Health Expenditure And Economic Growth In Brics Countries

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Abstract:

Background: *Inter linkage between factors such as economic growth, public health spending, cost of health care and poverty eradication is significant. Public health expenses in BRICS countries are inadequate and access to public health care system are marred by various socio-economic conditions. On the flip side, private health care facilities are not affordable to the poor and it mostly leads to out-of-pocket payments.*

Objective: *The purpose of this study is to analyze the causal relationship between per capita public health expenditure and per capita GDP of BRICS countries.*

Materials and Methods: *The study uses annual data of five countries from 1995-2013 and data for the study were obtained from World Bank. Unit root test is employed to check the stationarity of the data for all the five countries and Granger causality test is utilized to test causal relationship between two variables. Durbin-Watson test is used to test Co-integration regression between the variables.*

Results: *The results indicate that there is causality from per capita GDP to per capita public health expenditure while it has not observed any causality from per capita public health expenditure to per capita GDP for BRICS countries.*

Conclusion: *The findings reveal that economic growth is an important factor for the growth of public health expenditure which in turn plays a crucial role in providing better health care facilities for the deprived sections of the society. The policy implication is that government of respective BRICS countries has to increase its budgetary allocation to the health sector for bringing down out-of-pocket payments.*

Keywords: BRICS, per capita public health expenditure, per capita GDP, Granger causality

1. Introduction

The impact of better health on productivity and economic growth is manifold. Conventionally it is recognized that healthier work force may be more productive and have longer life expectancy than unhealthy ones which may result in greater returns to economic growth. Evidences indicate that household health expenditure reduces other expenses including food expenditure and this affects the nutritional status of the family leading to less productivity which ultimately results in poverty. On the other hand, public health expenses in developing countries are inadequate and private health care facilities are not affordable to the poor and it mostly leads to out-of-pocket payments. Many studies suggest that there is inequality in accessing health facilities and poor health infrastructure exist in low income countries

particularly African and Latin American countries (Gerdtham *et al* 1992; Castro-Leal *et al* 2000).

Providing better health care facilities to her populations is a challenging task to many developing countries. An appropriate health intervention strategy can lead to sustainable economic growth and reduce inequality. In this regard, the governments of those nations frequently announce health care policies, which are expected to enhance the human capital and resulting in productive labour force. Inter linkage between factors such as economic growth, public health spending, cost of private health care and poverty eradication is significant. Several studies have been carried out to examine the impact of public health expenditure on economic growth, either among many countries or between the regions of a particular country (Kleiman 1974; Newhouse 1977). However, researchers

have not adequately investigated the impact of public health expenditure on economic growth of BRICS countries. The background of this study is to analyze the per capita public health expenditure of BRICS in relation to per capita GDP. BRICS stands for Brazil, Russia, India, China and South Africa. In 2011, BRICS forum was formed to encourage commercial, political and cultural cooperation between the BRICS nations. BRICS constitutes the fastest growing and largest emerging markets in the world. Over the last few decades public health expenditure has been increasing in the BRICS countries like that of OECD countries (World Development Indicators, 2014). However in 2013, OECD countries total health expenditure (as % of GDP) and public health expenditure (as % of GDP) is almost twice to that of BRICS expenses on those two health variables. In the same year, BRICS countries public health expenditure (as % of total health expenditure) was only 46.53% and they contributed to 3.29% of GDP. During the same period of time, OECD countries public health expenditure (as % of total health expenditure) was 61.43% and public expenditure on health (as % of GDP) was 7.60% which is more than two times than that of BRICS countries put together. Contribution of private health expenditure and out-of-pocket health expenditure to that of total health expenditure is higher in BRICS than OECD countries.

Table 1: Health Expenditure - OECD Vs BRICS, 2013

Variables	OECD	BRICS
Total health expenditure (% of GDP)	12.33	6.93
Public health expenditure (% of GDP)	7.60	3.29
Private health expenditure (% of GDP)	4.71	3.63
Public health expenditure (% of total health expenditure)	61.43	46.53
Private health expenditure (% of total health expenditure)	38.57	53.47
Out-of-pocket health expenditure (% of total expenditure on health)	13.98	35.42
Out-of-pocket health expenditure (% of private expenditure on health)	36.37	65.29

Source: Author's Tabulation of Health Nutrition and Population Statistics, World Databank.

2. Literature Review

The degree of relationship between health expenditure and GDP has been tested by numerous empirical studies (Baltagi *et al* 2010; Nistor *et al* 2010). In the majority of relevant studies, several researchers have identified that there exists a positive correlation between real per capita public health expenditure and real per capita GDP (Gerdtham and Löthgren 2000; Hitiris and Posnett 1992; Hansen and King 1996). Recently, the attention of researchers has turned towards investigating the causality between health expenditure and economic growth and this has become a critical subject of extensive literature in health economics.

Theoretically, the causal relationship between health and economic growth should be bidirectional (Mushkin 1962; Grossman 1972; Van Zon 2001). Devlin and Hansen (2001) tested the Granger causality between health expenditure and GDP by using annual OECD data from 1960-87 and concluded that there would be bi-directional relationship between health expenditure and GDP. Numerous studies have been conducted on the causal relationship between economic growth and health expenditure. However the findings are contradictory in nature. Erdil and Yetkiner (2009) constructed a panel data set for low, middle and high income countries to investigate the Granger causality between real per capita GDP and real per capita public health expenditure. The analysis verified that the dominant type of causality is bi-directional. However the analysis concluded that there exist one-way causality running from GDP to health in low and middle income countries whereas the reverse holds good for high income countries. Similarly, Mehrara and Musai (2011) studied causal relationship between health expenditure and GDP for Iran using annual data from 1970-2008. The results of Granger causality indicate unidirectional effect from GDP to health expenditure but no evidence for health expenditures'

effect on GDP.

Hansen and King (1996) conducted a country wise ADF test for unit root prior to the co-integration tests and found that panel data estimates of the GDP and the health spending relationship may be spurious. It is clear from the empirical studies that most of the research on health expenditure and economic growth have largely utilized panel data analysis and employed different forms of quantitative approach in their research work.

3. Materials and Methods

The study pooled annual data for the period 1995-2013 for BRICS countries. The data used in the empirical analysis were sourced from the World Bank, World Development Indicators (WDI). In this research paper, public health expenditure and GDP are expressed in terms of (*log of*) per capita public health expenditure and (*log of*) per capita GDP.

To test the nature of association between the variables, the empirical investigation in this research paper follows three main steps:

(1) Testing for stationarity in the variables of per capita public health expenditure and per capita GDP. Augmented Dickey Fuller (ADF) unit root test was carried out for the variables, both in logarithm. The results indicate the series are non-stationary (Table-3).

(2) Durbin-Watson test is used to assess co-integration regression between the variables and it requires estimation of co integrating regression on the following equation: $ln\ GDP_{it} = \alpha_{i} + \beta_{1} ln\ PCPHE_{it} + \varepsilon_{it}$

where $lnGDP_{it}$ is *log of* per capita GDP in country $_i$ at time $_t$, α is vector of exogenous variables, β is vector of coefficients, *ln PCPHE* is *log of* per capita public health expenditure and ε is panel error term.

At last, causal relationship between the variables is tested for granger causality and the result indicates unidirectional causality from GDP to public health expenditure.

E-views statistical software package was used in the empirical analysis.

4. Results and Discussion
Table 2: Unit root table: ADF Test

Variables	At level		At 1ˢᵗ difference		Stationarity
	Critical values	t– stats	Critical values	t– stats	
ln BRICS PCGDP	1.96	1.35	1.90	1.96	*I(1)*
ln BRICS PCPHE	1.96	1.33	1.96 1.96**	1.79 5.58**	*I(2)*
ln BRA PCGDP	3.04	0.02	1.96	2.69	*I(1)*
ln BRA PCPHE	1.96	0.89	1.96	2.19	*I(1)*
ln CHI PCGDP	1.96	0.89	1.96	2.19	*I(1)*
ln CHI PCPHE	1.96	2.00	3.71	4.51	*I(1)*
ln IND PCGDP	1.96	4.00	1.96	3.00	*I(1)*
ln IND PCPHE	1.96	1.44	1.96	4.41	*I(1)*
ln RUS PCGDP	1.96	1.78	1.96	2.62	*I(1)*
ln RUS PCPHE	1.96	1.58	1.96	2.48	*I(1)*
ln SA PCGDP	1.96	0.87	1.96	2.59	*I(1)*
ln SA PCPHE	1.96	1.39	1.96	2.87	*I(1)*

*Note: All critical values given are for 5%; ** denotes second difference values*

Table 3 shows testing for stationarity in the variables of per capita public health expenditure and per capita GDP. Unit root test is employed to check the stationarity of the data for all the five member countries of BRICS as well as for the group seperately. The results indicate the series are non-stationary and it necessitates testing for co integration. Durbin-Watson test is used to test co-integration regression between the variables. The result of the co-integration regression equation are shown below

Table 3: Co-integration Regression Test, BRICS

Group	Dependent Variable	Constant	Independent Variable	Adj R^2	F-value	DW Stat.
BRICS	PCGDP	9.36 (52.63)	0.85 (44.59)	0.99	1988.97	0.71[*]
	PCPHE	-10.80 (-24.03)	0.16 (44.59)	0.99	1988.97	0.71[*]

Note: denotes one percent level of significance; Figures in arenthesis indicates t – statistics

The result of the test shows error coefficient results are less than one and statistically significant at one percent level of significance. Further, the results imply variables understudy are co integrated. Country- by- country analysis to examine the co integration between GDP and public health expenditure has also been carried out to check the robustness of the data. The results are given below

Table 4: Country wise co-integration regression test

Countries	Dependent Variable	Constant	Independent Variable	R^2	Adj R^2	F-value
Brazil	PCGDP	1.95 (31.15)[*]	0.78 (28.97)[*]	0.98	0.97	839.69
	PCPHE	-2.38 (−14.75)[*]	1.24 (28.97)[*]	0.98	0.98	839.69
Russia	PCGDP	1.44 (17.20)[*]	1.00 (26.78)[*]	0.97	0.97	717.48
	PCPHE	-1.33 (−10.11)[*]	0.97 (26.78)[*]	0.97	0.97	717.48
India	PCGDP	2.08 (42.22)[*]	0.83 (16.16)[*]	0.93	0.93	261.27
	PCPHE	-2.27 (−11.48)[*]	1.11 (16.16)[*]	0.93	0.93	261.27
China	PCGDP	1.99 (76.27)[*]	0.80 (49.62)[*]	0.93	0.99	2462.71
	PCPHE	-2.46 (30.18)[*]	1.23 (49.62)[*]	0.99	0.99	2462.71
South Africa	PCGDP	1.89 (22.89)[*]	0.80 (21.40)[*]	0.96	0.96	458.06
	PCPHE	-2.19 (10.67)[*]	1.19 (21.40)[*]	0.96	0.96	458.06

Note [*] denotes one percent level of significance
Figures in parenthesis indicates t – statistics

Further, diagnostic checks including Normality test (*Jarque – Bera*), Heteroskedasticity Test (*Breusch-Pagan-Godfrey*) and Stability Test (*Cusum Test*)

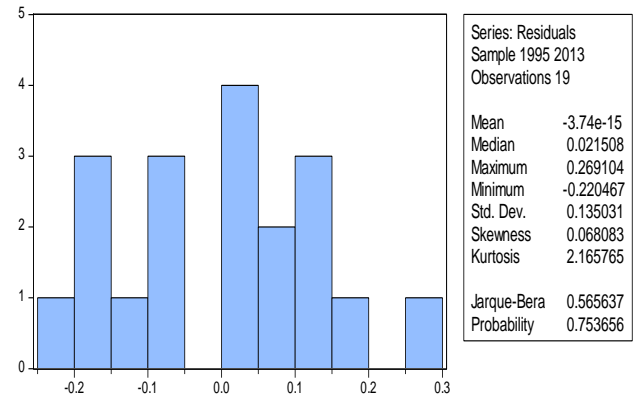have been carried out which indicates that the model is normally distributed and stable.

Figure1: Normality test - jarque – bera (JB)

Table 5: Heteroskedasticity Test - Breusch-Pagan-Godfrey

F-statistic	1.081924	Prob. F(1,17)	0.3128
Obs*R-squared	1.136856	Prob. Chi-Square(1)	0.2863
Scaled explained SS	0.530490	Prob. Chi-Square(1)	0.4664

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 09/26/15   Time: 15:26
Sample: 1995 2013
Included observations: 19

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.046902	0.061854	-0.758270	0.4587
LBRICS_PGDP	0.003729	0.003585	1.040156	0.3128

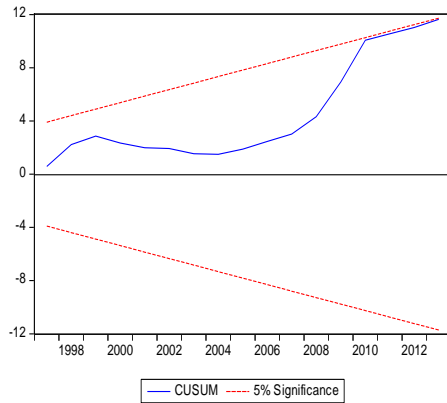|			
R-squared	0.059835	Mean dependent var	0.017274
Adjusted R-squared	0.004531	S.D. dependent var	0.019162
S.E. of regression	0.019118	Akaike info criterion	-4.977062
Sum squared resid	0.006214	Schwarz criterion	-4.877647
Log likelihood	49.28209	Hannan-Quinn criter.	-4.960237
F-statistic	1.081924	Durbin-Watson stat	1.791568
Prob(F-statistic)	0.312836		

Figure 2: Stability test - Cusum test

Co-integration regression test indicates causality exists between the series. To study the direction of causal relationship granger causality test is done for BRICS and the result indicates unidirectional effect from GDP to public health expenditure but no such effect from public health expenditure to GDP. However, country wise results are significantly different from the analytical result obtained for BRICS. The estimates of the study conform to the results found in earlier research.

5. Conclusion

The econometric study suggests that during the study period there exists a direct relationship from GDP to public health expenditure. It was also observed that health systems of the BRICS countries are facing a daunting task of increasing public health expenditure. In order to take advantage of the abundant population, public intervention in the field of health becomes paramount importance to increase the standard of human capital. The policy implication is that government of respective BRICS countries has to increase its budgetary allocation to the health sector for bringing down out-of-pocket payments.

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