

Testing the long run relation between health investments and economic growth in India

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Abstract

The current study investigates the validity of health led growth hypothesis in India by checking the existence of relationship between health investments and economic growth. For the purpose, data on healthcare expenditures of both private and public sectors were collected for a period of 1980 to 2020 along with the GDP data for the same time period. An ARDL model was used to check for the relationship. Findings suggest that private healthcare investments have insignificant impact on growth while public healthcare has a significant positive impact on the growth, suggesting the importance of prioritising healthcare investment to foster economic progress.

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Keywords: Health-led growth hypothesis, Health expenditures, GDP, Cointegration analysis, ARDL.

1. Introduction

Healthcare investments have been proposed to lead to higher economic development through the proposition of Health-led-Growth Hypothesis. The main argument favouring the hypothesis is the interrelation of health and human capital, which is a major driver for economic development. Health impacts the human capital by directly impacting the physical and mental wellbeing of the individual, thereby impacting the ability to acquire and apply knowledge and achieve higher productivity [5,16].

So the idea is that as individuals invest in healthcare and get healthier, their productivity increases leading to attainment of higher overall output for the economy and leading to higher levels of economic growth [8,9,19]. This hypothesis also suggests that the investments made in healthcare also lead to reduction of poverty and inequality, thus promoting social and economic development.

In this regard, the current study intends to investigate the existence of the health-led growth hypothesis in India.

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2. Literature review

Hitiris and Posnett performed a preliminary investigation into the factors influencing health expenditures, utilising data from 20 OECD nations spanning 1960 to 1987 [10]. They found higher incomes leads to higher healthcare spending, and presence of elderly population leads to higher total health expenditure. Gerdtham and Löthgren examined the stationarity and cointegration of GDP and health expenditure across 21 OECD nations from 1960 to 1997 [7]. They determined that both variables were non-stationary and exhibited a cointegrating relationship in the long run. Recent studies in African countries of Botswana and Nigeria also have a long-run link between health investments and economic growth by employing multiple cointegration techniques [13].

Kiyamaz et. al. analysed the unit root properties and long-term relationship between healthcare expenditure, GDP, and other variables in the Turkish economy from 1984 to 1998 [11]. They found unit root properties and a cointegrating relationship between GDP and healthcare expenditure, with a one-way causality from GDP to healthcare expenditure. Sülkü and Caner extended the study of GDP and healthcare expenditure in Turkey from 1984 to 2006, after healthcare reforms were implemented. The income elasticity of healthcare expenditure diminished, signifying its transition into a necessity. Private healthcare expenditure continued to be a luxury in the Turkish economy. The improvements alleviated the financial strain on healthcare.

Baltagi and Moscone retested the relationship between health expenditure and GDP in 20 OECD countries from 1971 to 2004 [2]. With an elasticity less than 1, healthcare expenditure was concluded to be a necessity good in the OECD region. Bhat and Jain estimated the income elasticities of public and private health expenditure in India [3]. They found that state governments allocate a fixed percentage of GSDP to healthcare, and a 1 per cent increase in GSDP leads to a corresponding rise in health spending. Private health expenditure increased rapidly, raising concerns about affordability.

Exports and research and development positively influenced revenue, whereas imports adversely affected it. Hartwig studied the health-led growth theory across 21 OECD nations from 1970 to 2005 [9]. The findings did not corroborate the theory for high GDP nations but identified a growth-inducing effect of health expenditure in OECD countries. Farag examined the correlation between health expenditure and GDP across high, middle, and low-income nations [6]. Research indicates that health

care expenditure is most sensitive to income fluctuations in middle-income countries, while high-income and low-income nations have diminished responsiveness.

Bhattacharjee et.al. investigated the impact of the relative percentages of public and private health spending on income inequality [4]. Using data from the 42nd round of NSSO (1986-87) as the baseline year and subsequent NSSO rounds' data from 1987-2012, they measured inequality using the Gini coefficient. The results from OLS and IV models showed that an increase in the number of private healthcare providers was associated with higher levels of inequality.

Atilgan et. al. investigated the health-led growth theory in Turkey by evaluating the correlation between healthcare expenditure and economic growth [1]. Analysing real per capita GDP and per capita healthcare expenditure as variables revealed that a 1 per cent rise in health spending resulted in a 0.434 per cent increase in GDP, thereby corroborating the health-led growth hypothesis within the Turkish economy.

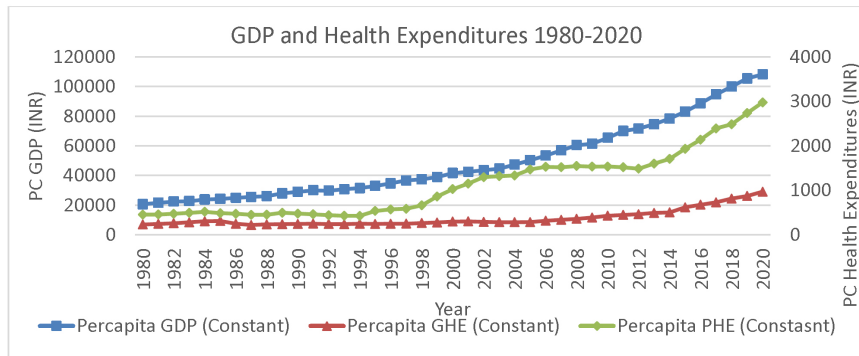
3. Data description

To examine the long-term association between health investments and economic growth, the subsequent data sources were utilised.:

- Per capita GDP (in 2011-12 constant prices) – National Accounts, GoI.
- Government Health Expenditure (GHE) – MoHFW; and budget estimates, GoI.
 - o GHE data was deflated using GFCE Deflator.
- Private Health Expenditure (PHE) – PFCE on Health (in 2011-12 constant prices)

Additionally, PFCE on education (PFCEE) and Gross Capital Formation (GCF) were used to control the effects of investment in education as well as general investments in the economy. These control variables were collected in terms of 2011-12 constant prices. The health expenditures and control/exogenous variables were converted to per capita (PC) terms. Detailed table of the variables can be found in Appendix – A.

Figure 1 depicts the trends in per capita national income and per capita health expenditures, both public and private. The per capita incomes have grown constantly from ₹20,662.30 in 1980 to ₹1,08,247.30 in 2020. The government health expenditures have not seen any significant increase from 1980 to 2005. However, there has been a consistent upward trend in



Source: National Accounts and MoHFW, GoI.

Figure 1
GDP and Health Expenditures Per capita (1980-2020)

public health expenditure since 2006 from ₹315.68 to ₹968.78 in 2020. The private health expenditures too were constant from 1980 to mid-1990s but started to rise up rapidly around the turn of the millennium. The trend has persisted for a decade when the per capita private health expenditure has reached ₹1,528.31 in 2006. This trend signifies an increase in demand for healthcare from individuals during the time period. The expenditure level has sustained till 2012 post which the expenditures rose rapidly yet again from ₹1600.97 in 2013 to ₹2977.99 in 2020. Overall trends signify a low public spending and disproportionately high and increasing private expenditure for healthcare in India.

4. Methodology

Using the annual data on the national income and health expenditures, both private and public, the current study examines the long-run relationship between GDP and health expenditures. For this purpose, a cointegration technique was used. Engle-Granger and Johansen cointegration tests are the most commonly used tests for cointegration. However, these tests can only be used under the prior condition that series are integrated to the same order [22,1]. On the other hand, the Autoregressive Distributed Lag (ARDL) bounds test developed by can be used regardless of whether the variables under investigation are integrated of order one or zero.

So, the current study used the annual data which was available from 1980 to 2020 and used an ARDL model with Error Correction Form. The

data was collected from National Accounts of GoI. Additionally, we also used Gross Capital Formation (GCF) and Private Education Expenditure as control variables for the model.

ARDL Model Specification

The ARDL approach is a widely used econometric technique that allows researchers to study both short and long-run linkages among variables. It is an Ordinary Least Squares model that integrates the lags of dependent and independent variables as estimators. The standard representation of the ARDL model is:

$$ARDL(p, q): Y_t = \beta_0 + \sum_{i=1}^p \beta_1 Y_{t-i} + \sum_{i=0}^q \delta_1 X_{t-i} + \varepsilon_t$$

Here, p and q denote the lags of dependent and independent variables, respectively. The word, Y_{t-i} denotes the lags of the dependent variable, whereas X_{t-i} includes the independent variable together with its lags.

5. Results

5.1 Stationarity Tests

Table 1
Stationarity Test Results (ADF)

Variable	I(0)			I(1)		
	Level	Intercept	Trend+ Intercept	Level	Intercept	Trend+ Intercept
ln(PCGDP)	7.283	1.016	-3.376	-1.285	-4.535**	-4.612**
ln(PCGHE)	1.906	2.626	0.157	-2.906**	-3.86**	-4.643**
ln(PCPFCEH)	1.818	0.06	-2.418	-3.234**	-3.779**	-3.861
ln(PCGCF)	3.851	0.388	-2.461	-3.156**	-8.507**	-8.517**
ln(PCPFCEE)	6.433	1.532	-2.91	-3.1**	-4.636**	-4.944**

Source: Author's Calculations.

Table 1 presents the unit root test results. The results reveal that all variables exhibit stationarity at first difference, indicating that variables are integrated to the order of 1 $I(1)$ and thus possess a stochastic trend. This satisfies the stationarity condition require for applying ARDL cointegration test.

5.2 F-Bounds Test for Cointegration and Long-Run Estimates

The results of the F Bound test and the long run equation are presented in Table 2. Our calculated F statistic for the test is found to be 7.02. By comparing to the critical values provided, the dependent and independent variables are found to be in a cointegrating relationship at 1% significance level.

Table 2
Results of the F-Bounds Test for Cointegration

F-Bounds Test		<i>Null Hypothesis: No levels relationship</i>		
Test Statistic	Value	Significance Level	I (0)	I (1)
F-statistic	7.018941	10%	4.19	5.06
k	2	5%	4.87	5.85
		2.50%	5.79	6.59
		1%	6.34	7.52
Selected Model: ARDL(4, 4, 4)				
Variable	Coefficient	Standard Error	t-Statistic	Probability
PCGHE	0.210759	0.011465	18.38267	0.0000
PCPHE	-0.01486	0.011814	-1.25813	0.2236
Long run Equation = PCGDP - (0.2108*PCGHE -0.0149*PCPHE)				

Source: Author's Calculations.

Further, a lag structure of (4,4,4) was found to be optimal as per the AIC. Subsequently, the ARDL model with a lag structure of (4,4,4) was utilised in estimating both the short and long-run coefficients. The estimated long-run coefficients revealed a statistically significant positive effect (0.21) of public health expenditure on national income, suggesting that an increase of one unit in government healthcare expenditure leads to a 21% increase in the national income of India. However, in contrast, the impact of private healthcare expenditure on national income was found to be statistically insignificant.

5.3 Short Run Coefficients and Error Correction Term

The estimated short-run coefficients, along with Error Correction Term (ECT). The coefficients indicate that Government Healthcare Expenditure (GHE) and Private Healthcare Expenditure (PHE) have similar effects on the dependent variable, not only in the long run but also in the short run. The control variables of GCF and PFCE on education

have an expected significant positive impact on national incomes. The estimated Error Correction Term (ECT) is found to be -1.61 depicting the existence of an oscillatory convergence between the variables (Narayan and Smyth, 2006). This indicates that any deviations from the equilibrium in a given year will be adjusted for by approximately 160% in the subsequent year. The negative sign of ECT implies a tendency for the system to correct itself towards equilibrium in response to any disequilibrium shocks.

The analysis reveals that while public health expenditure (PCGHE) has a significant positive effect on economic growth, private health expenditure (PCPHE) appears statistically insignificant in the long-run model. This result may be attributed to a potential crowding-out effect, whereby higher public investment in health services reduces the demand or necessity for private expenditure. Additionally, private health spending in India often includes informal payments and out-of-pocket costs that are inconsistently recorded in national datasets, which may introduce measurement errors. The fragmentation of private spending and its concentration in urban or higher-income populations might further explain its limited macroeconomic impact in the aggregated analysis.

5.4 Diagnostic Tests

Table 3
Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.082451	Prob. F(4,15)	0.134
Obs*R-squared	13.21069	Prob. Chi-Square(4)	0.0103
<i>Null: No Serial Correlation</i>			

Source: Author's Calculations.

To confirm the robustness and reliability of the statistical findings, a series of diagnostic checks were performed to detect potential serial correlation and to test the stability of the model. The Breusch-Godfrey LM test was applied to investigate the presence of autocorrelation. As reported in Table 3, the test results reveal no evidence of serial correlation, thereby reinforcing the validity of the estimated coefficients and the consistency of the results.

In addition, the stability of the model over time was examined using the CUSUM and CUSUM Square tests. The corresponding plots, illustrated

in Figure 2, display the cumulative sums of the estimated coefficients and their squared values, serving as graphical tools to identify possible structural breaks or shifts in variable relationships. Both tests confirm that the model remains stable at the 5% significance level, indicating that no major changes or instabilities occurred in the relationships among the variables during the study period.

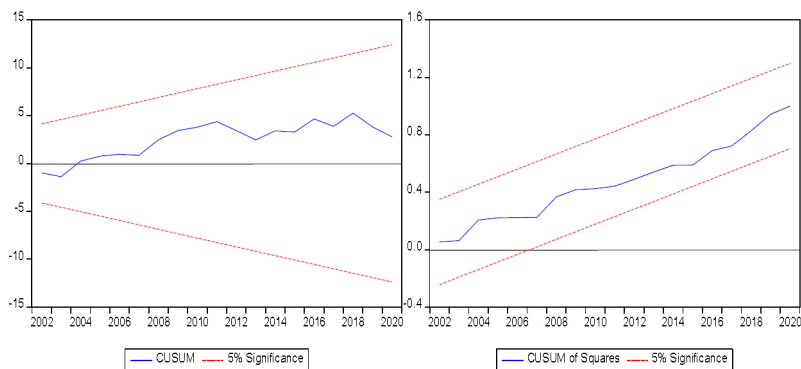


Figure 2
CUSUM and CUSUM Square test for Model Stability

6. Conclusions

The current study focused on finding the overall long-term relationship between the health expenditures and the GDP of the Indian economy. In doing so, the government health expenditure is found to have a positive impact on the national income in the long run. This validates the health-led growth theory for the Indian economy, at least partially. However, the private expenditures showed an insignificant relationship with the GDP. These findings highlight the importance of public health expenditure in driving economic growth and income generation at the national level in India. The results suggest that policies aimed at increasing government investment in healthcare can yield positive economic outcomes. However, it is crucial to note that private expenditure on healthcare does not appear to have a significant influence on national income. This may indicate that the role of private healthcare provision in stimulating economic growth requires further examination and potential policy considerations.

These findings have important implications for India's progress toward achieving the Sustainable Development Goals (SDGs), particularly

SDG 3.8, which emphasises universal health coverage (UHC). The demonstrated positive impact of public health investment on growth of economy reinforces the critical role of government-led health financing in ensuring equitable access to healthcare. Strengthening public investment in health infrastructure and services not only contributes to improved health outcomes but also supports broader economic growth, inclusivity, and resilience. This alignment with India's SDG commitments underscores the necessity of sustained and strategic public health spending as a cornerstone of development policy.

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