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AN EXPLORATION INTO THE NEXUS BETWEEN HEALTH EXPENDITURE AND ECONOMIC GROWTH IN INDIA

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Abstract
The study aims to examine the relationship between health expenditure and economic growth in India. For this purpose, the study used time series data of India over the period 2000 to 2018. The empirical analysis was done by using various econometric tools like Unit Root Tests, Cointegration Tests, Vector Error Correction Model, and Granger Causality Test. The Cointegration and Causality Tests were performed to examine the long-term and short-term relationship between health expenditure and economic growth respectively. The findings from the Johansen Cointegration Test indicated that there exists a long-term relationship between health expenditure and economic growth. Furthermore, the Granger Causality results confirmed that there exists a unidirectional causality between health expenditure and economic growth. The existence of a long-term and short-term relationship between health expenditure and economic growth highlights the significance of investing in the health sector in India. Thus, India is an example of a developing country where health expenditure aids economic growth. Hence, investments in the health sector should be promoted, and the government's budget allocation for the health sector should be increased.

Keywords:
Health Expenditure, Economic Growth, Cointegration Test, Vector Error Correction Model, Granger Causality Test.

1. Introduction

Economists began to emphasize the relevance of human capital as a determinant of economic growth in the early 1990s. Since then, both theoretically and empirically, the relevance of health and education in economic growth has gotten a lot of attention (Esen & Keçili, 2021). The accumulation of human capital is a significant determinant of economic growth (Romer, 1990). According to the human capital hypothesis, human capital development creates better productivity in both market and non-market activities (Grossman, 1999). Health is the underlying factor of the human capital hypothesis (Becker, 1964; Mirowsky & Ross, 1988). It is also a significant indicator of economic development and the well-being of the people. It is considered capital in the health-led growth theory. The health-led growth theory asserted that investing in health leads to increased productivity and, as a result, increased income and economic growth (Piabuo & Tieguhong, 2017). According to the endogenous growth model, a healthy and educated workforce can efficiently use technology (Romer, 1986). Also, investment in health ensures the improvement of labour productivity and fosters the financial well-being of the people (Grawitch et al., 2006). A healthy population can live longer and have more opportunities to acquire human capital skills. Thus, health is widely acknowledged as a crucial driver of human capital development and economic growth.

Human capital development requires health infrastructure, mainly in developing countries, because health and human capital development are interrelated. Health infrastructure is widely acknowledged as a critical component of social infrastructure. Furthermore, the state of one's health is influenced by the country's healthcare spending. According to the World Health Organization (1998), illness and low life expectancy account for half of the economic disparities between developed and developing countries. Developed countries devote a large amount of their GDP to healthcare because they feel that the health of their citizens is a significant catalyst for economic growth.

The positive relationship between GDP and healthcare spending is mainly due to two reasons. Firstly, higher GDP means more money available for healthcare in both the public and private sectors.

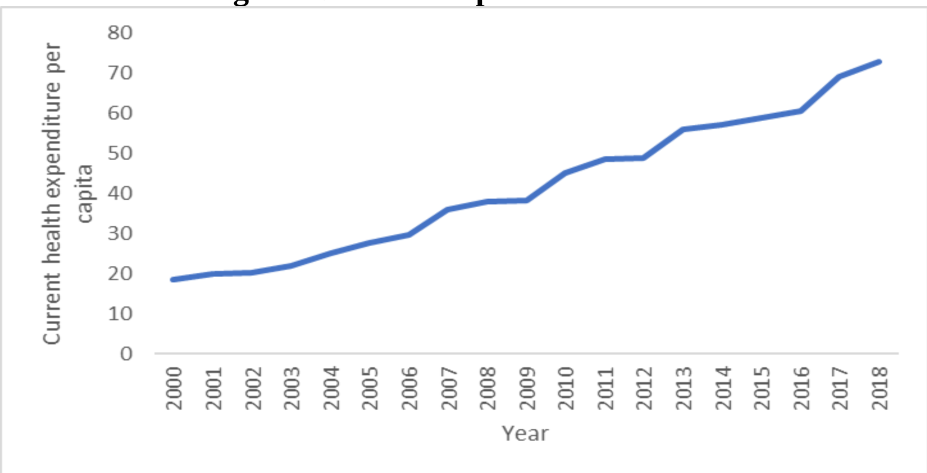
Secondly, higher health spending may result in improved health, which may lead to increased GDP. A healthy population is more productive, which is a source of income for the state. As a result, the causal relationship between health spending and GDP could be in either or both directions (Bukhari et al., 2007).

The study aims to examine the relationship between health spending and economic growth in India. Increased health spending has a significant impact on a country's socio-economic situation. However, there is no unanimity on whether increased health spending is beneficial or harmful to economic growth. The present study uses India as a case study to investigate the dynamic relationship between health spending and economic growth. The rest of the paper is organized as follows: Health Expenditure in India, Literature Review, Data and Methodology, Empirical Results, and Conclusion.

2. Health Expenditure in India

Total health expenditures include expenditures for preventive, promotive, and curative health services, family planning and nourishment activities, and health-related treatments (Bokhari et al., 2007). Despite low health indicators, India spends far less on healthcare than is needed. Low levels of health expenditures have been a major concern, resulting in limited access to affordable and high-quality healthcare. According to the National Crime Records Bureau, 0.38 million people in India committed suicide due to a lack of treatment facilities between 2001 and 2015. This accounts for 21 percent of all suicides within that period. According to the National Sample Survey Office, the number of unpaid health-related loans increased between 2002 and 2012 in India (Pandey, 2018). According to the World Bank Database (2022), the current health expenditure per capita of India increased from 18.50 in 2000 to 72.83 in 2018. The current health expenditure per capita of India (72.83) is higher than its neighbouring countries such as Bangladesh (41.91), Pakistan (42.87), and Afghanistan (49.84). But far less than the OECD members (4885.49), European Union (3525.06), and Latin American countries (666.92).

Figure 1: Health Expenditure in India



Source: World Bank Database, 2022

3. Literature Review

The health sector is a topic of continuous research among researchers. Many studies have been conducted on the relationship between health spending and economic growth in both developing and developed nations. Wang and Lee (2018), for example, conducted a study in 24 countries to investigate the relationship between health spending and economic growth. They revealed that health spending has a significant impact on economic growth using regression analysis. Furthermore, using the same methods, Bakare and Olubokun (2011), Emadzadeh et al. (2011), Mojtahed and Javadipour (2004), Naidu and Chand (2013), Ogundipe and Lawal (2011), and Piabuo and Tieguhong (2017) confirmed the same conclusion.

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Additionally, with the help of VAR analysis, Bayarbat and Li, (2020) and Bukenya (2009) exhibited a positive relationship between health spending and economic growth. Wang (2011) used a different methodology to accentuate the same issue. He discovered that health spending has a significant influence on economic growth with the help of VECM. Based on the ARDL technique, Atlgan et al. (2017) and Erçelik (2018) discovered that health spending has a positive influence on economic growth. Using the GMM technique, Halc-Tülüce et al. (2016) discovered a negative relationship between health spending and economic growth. A negative relationship between health spending and economic growth has also been observed by Eggoh et al. (2015) and Yang (2019).

The causality between economic growth and health spending is also highlighted in some studies. Mukherjee (2017), for example, discovered a bidirectional causality between economic growth and health spending. Boussalem et al. (2014), Khan et al. (2016), Leidl (1998), Nasiru and Usman (2012), ztürk and Ada (2013), and Soni and Jariwala (2019) have all demonstrated the significance of bidirectional causality between economic growth and health spending. In the short run, however, Esen and Keçili (2021) discovered a unidirectional causality between economic growth and health spending. Dincer and Yuksel (2019) claim that there is no causal relationship between health spending and economic growth.

The literature shows that several scholars have examined the relationship between economic growth and health spending. But there is no unifying outcome regarding the existence and direction of causality. Differences in results might be due to factors like country-specific reasons, or methodologies. In addition to this, it can be observed that many types of techniques, such as regression, VECM, VAR, GMM, Granger causality analysis, and ARDL, are taken into account. To obtain reliable results, it is critical to apply the appropriate variables and methodologies for the study. This research examined whether or not there is a long-term relationship between economic growth and health spending. This research also examined their existence as well as the direction of causality.

4. Data and Methodology

This study aims to investigate the relationship between India's economic growth as measured by GDP in current US dollars and health expenditure in current US dollars. For the analysis, yearly time series data from 2000 to 2018, a 19-year period, were used, and they were collected from the World Bank Database.

The proposed econometrics model with Y = f (HEX), where Y is the log value of GDP and HEX is the log value of Health Expenditure, has been tested. The formal linear model can be formed in the following manner.

$$lnY_t = \beta_0 + \beta_1 \, ln\mathrm{HEX}_t + \mathrm{U}_t$$

Where, Y_t is Gross Domestic Product, HEX_t is health expenditure, β's are regression coefficients, U_t is the error term and ln is the natural log.

As the time series dataset has been employed to conduct the empirical analysis, it is essential to test the stationary property of each variable. Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) Unit Root Tests were used for testing the stationarity of the variable. The Johansen technique was used to determine the cointegration between the variables. The Vector Error Correction Model (VECM) was used to examine the existence and direction of causation. The Granger causality test was used to evaluate the existence and direction of causality between variables in the short run. Finally, the impact of health expenditure on GDP was investigated using the impulse-response function.

5. Empirical Results

This session gives the results generated using time series econometric tools such as the Unit Root test, Johannsen Cointegration, Vector Error Correction Model, and Granger Causality tests.

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Test for Stationarity

The series is checked for unit root to detect if it's stationary or not. The series is considered stationary if its probability distribution remains constant over time. The Augmented Dickey-Fuller (ADF) test is mostly used as a unit root test. The ADF test uses the ordinary least squares (OLS) estimator to detect the existence of a unit root in a series. The unit root is also checked using the Phillips–Perron (PP) test. The bandwidth provided by the Newey-West technique is used for the PP test. If there is a dispute between the ADF and PP test, the latter is preferred since it has a better autocorrelation correction. The following hypotheses are formulated to test the unit root.

Null Hypothesis (H_0): Variable has a unit root.

Alternative Hypothesis (H_1): Variable has no unit root.

The stationarity test results of variables are shown in Table 1. On conduction of the Augmented Dickey-Fuller Test and the Phillips-Perron Test on the level data, Log (GDP) and Log (HEX) are discovered not to be stationary. Subsequently, the data were differentiated and inquired for the first difference, and the results are confirmed to be stationary or have no unit root. Thus, the alternate hypothesis is accepted at a one percent level of significance at the first difference. Thus, the first difference of the variables is computed for further analysis.

Table 1: Unit Root Tests Results

Series	Test for unit root in	Augmented Dickey-Fuller Test		Phillips-Perron Test	
		t-Statistic	Prob.*	t-Statistic	Prob.*
Log (GDP)	Level	-1.244991	0.6307	-1.573943	0.4750
	First difference	-3.786868	0.0122	-3.769166	0.0126
Log (HEX)	Level	-2.064914	0.2594	-1.566698	0.4782
	First difference	-5.052894	0.0010	-5.252623	0.0007

*Mac Kinnon (1996) one-sided p-values

Optimal lag length selection

The optimal lag length selection is based on the Vector autoregression (VAR) and it must be done before the cointegration test. Table 2 shows the optimal lag length selection results. The LR, FPE, AIC, SC, and HQ are used to determine the best lag length. The optimal lag length, according to all these criteria, is 1.

Table 2: Optimal lag length selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	16.87488	NA	0.000657	-1.652765	-1.553834	-1.639123
1	58.99717	70.20381*	9.56e-06*	-5.888574*	-5.591783*	-5.847651*

* indicates lag order selected by the criterion

LR: Sequential Modified LR test statistic (each test at 5% level)

FPE: Final Prediction Error, AIC: Akaike Information Criterion, SC: Schwarz Information Criterion, HQ: Hannan-Quinn Information Criterion

Estimation of Long-Run Relationship

The Johannsen Cointegration Test is used to examine the long-run relationship between the variables. The result of the test is based on trace statistics and eigen value statistics. The following hypotheses are intended to examine the long-run relationship.

H_0: There is no Cointegration among the variables (No long run relationship between variables)

H_1: There is Cointegration among the variables (long run relationship exists between variables)

Table 3: Unrestricted Cointegration Rank Test (Trance)

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Hypothesized No. of CE(s)	Eigenvalue	Trance Statistics	Critical Value	Prob.**
None*	0.692102	46.23482	42.91525	0.0224
At most 1	0.328081	16.78518	25.87211	0.4312
At most 2	0.239508	6.844755	12.51798	0.3610

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

Table 4: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	Critical Value	Prob.**
None*	0.692102	29.44964	25.82321	0.0159
At most 1	0.328081	9.940430	19.38704	0.6252
At most 2	0.239508	6.844755	12.51798	0.3610

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

The result which is presented in the above tables reveals that the trace statistics and the max eigenvalue statistics reject the null hypothesis that there is no Cointegration between the variables with a lag one. The statistics indicate that there is one cointegrating equation at the 5 percent level of significance i.e., a unique relationship exists. Thus, the alternative hypothesis was accepted.

Normalized Cointegrating Coefficients

The normalized cointegrating coefficients of the Johannsen Cointegration test are given in Table 5.

Table 5: Normalized Cointegrating Coefficients

LGDP	LHEX
1.000000	-1.242204 (0.06219) * [19.97434] **

* denotes standard error
** denotes t-Statistic

Coefficients signs should be reversed in the normalized cointegrating equation of the Johansen model which is representing the long-run relationship. LGDP is the target variable. LHEX has a positive and significant impact on LGDP in the long run. An increase in LHEX will lead to an increase in LGDP.

Vector Error Correction Model

Based on the outcome of the Unit Root tests and Johansen Cointegration test, it was seen that there exists a long-run relationship between the variables. Thus, it is recommended to develop the Vector Error Correction Model. The speed of adjustment towards the long-run equilibrium following a short-run shock is indicated by the error correction model. The following equation is estimated to check error correction:

D(LGDP) = C(1)*(LGDP(-1) - 1.24220397276*LHEX(-1) - 23.327136127) + C(2)*D(LGDP(-1)) + C(3)*D(LHEX(-1)) + C(4)

Table 6: Vector Error Correction Model Estimation

Variable	Coefficient	Std. Error	t-Statistic	Probability
ECT(-1)	-0.401924	0.331333	-1.213051	0.0024

R-squared	0.242125	Mean dependent var	0.100962
Adjusted R-squared	0.067230	S.D. dependent var	0.077413
S.E. of regression	0.074765	Akaike info criterion	-2.146602
Sum squared resid	0.070668	Schwarz criterion	-1.950551
Log likelihood	22.24611	Hannan-Quinn Information Criter	-2.127114
F-statistic	1.384406	Durbin-Watson stat	2.280772
Prob (F-statistic)	0.291511		

The estimated results reveal that the estimated lagged error correction term is negative and significant, indicating that the model is corrected with errors. The feedback coefficient (Error Correction term) is -0.40, implying that nearly 40 percent of the previous year's disequilibrium is corrected in the current year.

Granger Causality Test

If series are individually I(1) and cointegrated, there is a causal relationship among variables at least in one direction. The Granger causality test is a technique for discovering whether one-time series is significant in forecasting another or not. In this study, the Granger causality test is used to check the causal relationship between GDP and health expenditure. Table 7 reports Granger causality test results with a lag of 1. The null hypothesis has been tested based on the P-value. If the P-value is less than the critical P-value at 5 percent then the null hypothesis is rejected and there will be a significant relationship between the variables.

Table 7: Pairwise Granger Causality Tests Results

Null Hypothesis	Number of Lags	F-Statistics	Probability	Result	Causal Relation
HEX does not granger cause GDP	2	4.38190	0.0373	Reject	Unidirectional Relation
GDP does not granger cause HEX	2	1.20134	0.3345	Accept	No Relation

Table 7 shows the outcomes of the Granger causality test for India. The p-value displays that there is a unidirectional relationship between health expenditure and GDP. Thus, as health expenditure increases, this raise has a significant impact on GDP. This result means that an increase in health expenditure is important in developing economic growth.

6. Conclusion and Policy Implication

The study empirically examined the relationship between health expenditure and economic growth by using the time series data of India. For this purpose, Unit Root tests, Cointegration, and Causality were tested to showcase the relationship between health expenditure and economic growth. The findings from the Johansen Cointegration Test indicated that there exists a long-term relationship between health expenditure and economic growth. Additionally, the Granger Causality results confirmed that there exists a unidirectional causality between health expenditure and economic growth. Thus, an improvement in the health status of the population leads to an increase in GDP, through a healthier and more productive labour force.

This paper proposes that health expenditure can be adopted as a factor that develops the human capital and well-being of the people. These developments are timed to coincide with the growth of the economy. As a result, the Government of India should incorporate investment in the health sector as a macroeconomic policy tool, as it enhances economic growth and is one of the few viable options for breaking the vicious cycle of poverty. Thus, investment in the health sector will be a catalyst for the growth of the Indian economy.

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