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THE IMPACT OF PUBLIC HEALTH EXPENDITURE ON ECONOMIC GROWTH IN HARYANA

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Abstract
This study examines the impact of public health expenditure on economic growth in Haryana using annual time-series data over the period 2001–2022. Economic growth is measured by State Gross Domestic Product (SGDP), while public health expenditure is decomposed into total public health expenditure, revenue expenditure on health, and capital expenditure on health. Total government education expenditure and administrative regulation research are included as control variables. The Autoregressive Distributed Lag (ARDL) bounds testing approach is employed to analyse both short-run and long-run relationships among the variables. The empirical results confirm the existence of a long-run equilibrium relationship between public health expenditure and economic growth in Haryana. Long-run estimates reveal that total public health expenditure has a positive and statistically significant impact on SGDP, indicating that sustained investment in public health enhances productivity and economic performance. However, revenue and capital health expenditures exhibit negative and significant effects, suggesting inefficiencies and allocation issues in expenditure composition. In the short run, changes in total public health expenditure stimulate economic growth, while other expenditure components exert a contractionary effect. Diagnostic and stability tests confirm the reliability and robustness of the model. The findings highlight the importance of not only increasing public health spending but also improving the efficiency and composition of health expenditure to promote sustained economic growth in Haryana. The study offers valuable policy insights for strengthening health financing and governance at the state level.
Keyword: Health Expenditure, Economic Growth.

1. Introduction

Health is an essential aspect of human resource development. Better health care is a primary human requirement. A healthy person can not only work more efficiently and effectively but also give more time to productive activities. Since healthcare expenditure is a core component of human capital investment, the rising trend of healthcare expenditure would tend to raise labour productivity, quality of life and general welfare. According to the World Health Organisation (WHO, 2005), fifty per cent of economic growth differentials between developed and developing nations is attributable to ill-health and low life expectancy. A study of Nigeria found that the government of Nigeria had placed emphasis on recurrent expenditure more than capital expenditure on health in the period under study. The findings show a positive relationship between healthcare expenditure and economic growth, which is in conformity with our a priori expectation (Bakare and Sanmi, 2011). The study, context of developing countries, employs both the Granger Causality Test and Panel Regression analysis over the period 1990–

2019. The results indicate that the association between GDP and government spending is unidirectional, where causality runs from government expenditure to national income (Ahuja and Pandit 2020). Total Public Health Expenditure (TPHE) plays a critical role in shaping the economic growth of an economy by enhancing the health status of the population and strengthening human capital formation. Healthier individuals are more productive, experience fewer workdays lost due to illness, and contribute more effectively to the production process. Consequently, public investment in health is widely recognised as a key determinant of sustained economic growth, particularly in developing economies where access to private healthcare is limited. The relationship between economic growth and public expenditure on health and, consequently, its impact on health outcomes, is the main subject of analysis and debate in recent years. Economic growth and public health expenditure in India are deeply interconnected. Over the past three decades, India has emerged as one of the world's fastestgrowing economies, with rising GDP, expanding industries, and a growing middle class. Several empirical studies have established a positive relationship between public health expenditure and economic growth. Cross-country studies indicate that higher public health spending leads to improvements in population health outcomes, which subsequently enhance productivity and growth. In developing countries, public health expenditure is often found to have a stronger impact on growth due to limited private health investment and higher dependence on government provisioning.

1.2 Review of Literature Economic Growth and Public Health Expenditure

The review of literature provides a comprehensive overview of existing theoretical and empirical studies examining the relationship between public sector expenditure, particularly health and economic growth. Understanding prior research is essential for situating the present study within the broader academic discourse, identifying dominant perspectives, and recognising methodological approaches used by earlier scholars. This review focuses on studies that analyse the role of total public health expenditure and its components, alongside education expenditure, in shaping economic growth, with particular emphasis on developing economies and Haryana. There is some important literature -

Mishra et al. (2007) examined the public expenditure on health and health outcomes in various states in India. The main objective of the study is to find out the relationship between higher growth and increased public expenditure on health. The main finding of the study is that health expenditure Granger causes IMR both in the short run and the long run, whereas IMR Granger causes health expenditure only in the long run. Goel et al. (2011) main objective of study was to examine the relationship between economic growth and public expenditure on health. The study found that there was a unidirectional causal relationship between public expenditure on health and economic growth, and a long-term equilibrium relationship between public expenditure on health and economic growth. Balarajan et al. (2011) identified key challenges to equity in service delivery and equity in financing and financial risk protection in India. Findings from the study suggest that economic growth provides a unique opportunity to increase financial commitments to support the public health system and health systems research. Boyacioglu (2012), according to the findings, improvements in key health indicators are required for long-term sustainability. Kim and Lane (2013) examined the relationship between public health expenditure and national health outcomes among developed countries.

The results found that higher public health expenditure provides good health results for individuals in a country. Kumar (2013) analyses India's changing pattern of public expenditure on health. The main objective of the study was to determine whether India spends a sizeable amount of public funds on the health sector and whether the funds are allocated properly. The result found that the state has an inadequate absorption capacity. India needs to double or triple its health spending. Asif and Sultan (2013) analysed the issue of inclusive growth in India in terms of public expenditure on healthcare and domestic income. The result found that there was no long-run relationship between per capita domestic income and per capita planned expenditure in India. Bagchi and Tripathi (2014) analysed out-of-pocket expenditure in India, its factors and consequences. Findings of the study show that 74.4 per cent of private expenditure on health was paid out of pocket. Kumar et al. (2014) examined the causal relationship between expenditure on health and the economic growth of the country. The main objective of the study was to determine whether health expenditure leads to economic growth or whether economic growth leads to health expenditure. Findings, expenditure on health and economic growth are co-integrated in all four Indian states. It was suggested by the study that states should increase efficiency and improve management to attract more public expenditure on health care services. Rana et al. (2018) analysed empirical evidence that the relationship between health expenditure and health outcomes varies across countries at different income levels. The results found that the relationship between public health expenditure and health outcomes is stronger in rich countries than in poor countries. Das and Guha (2017) examined the pattern of public healthcare expenditure in the northeastern states of India and also identified the nature of interstate variation in healthcare expenditure among the states. The findings of the study showed that the states having higher mean expenditure registered a lower compound annual growth rate in health expenditure, thereby causing a lower per capita value and a lower value of the composite index. Hajibabaei et al. (2017) examined the function of public health expenditure in developing countries. The results found that health expenditure determinants in developing countries are not under the direct control of the government. A comparative analysis of the impact of health expenditure between countries in the CEMAC sub-region and five other African countries that achieved the Abuja declaration is provided. The results found that public health expenditure has a positive effect on economic growth in the economy. Goal and Garg (2018) analysed the public expenditure on health and economic growth in Haryana for the period 1991-92 to 200708. The study's findings indicate a one-way causal relationship between public expenditure on health (PEH) and economic growth (GSDP) in the state of Haryana. Kingsley and Godwin (2019) investigated government expenditure on primary health care in Nigeria and its relation to real national output within the period 1980 to 2015. The result found that government health expenditure is effective for economic growth and the well-functioning of primary health care in Nigeria. Lyyappan et al. (2019) examined the relationship between public expenditure and economic growth in the state based on the annual data services from the period 2014–15 to 2018–19. The main findings of the study are that there is a low level of public spending on health and poor access to affordable and goodquality health care for the majority of India's population. Hudda (2020) measured healthcare expenditure indicators and the overall healthcare financing situation of a nation. The main finding of the study is that states like Haryana, Karnataka, Maharashtra, and West Bengal

show low per capita health expenditures. Hudda (2020) measured healthcare expenditure indicators and the overall healthcare financing situation of a nation. The main finding of the study is that states like Haryana, Karnataka, Maharashtra, and West Bengal show low per capita health expenditures. Kit (2021) examined the relationship between financial crises and per capita public expenditure on health in 97 countries. The result found that public health expenditure is low when financial crises occur in the country.

1.3 Research Gaps

Based on the review of the literature, most studies show the relationship between public health expenditure and health indicators. A few studies are based on the trends and patterns of health expenditure at the state level. Haryana spends only 1–2 per cent of its total GDP on health, which is lower than that of other wealthy states. On behalf of the literature review, the following question arises:

- Does public health expenditure affect the economic growth of Haryana?
- Does public health expenditure affect socioeconomic development?
- ➢ How successful or not successful are Haryana's various health policies?

1.4 The Main Objective of the Study

The proposed study is an attempt at public health expenditure in the Haryana state. The objectives of the study are-

1. To examine the impact of public health expenditure on economic growth in Haryana.
2. To provide some suggestions for further policy implications.

1.5 Data and Estimation Technique

The present study is based on time series secondary data of public health expenditure for the period 2000-01 to 2022-23 in the Haryana economy. The study uses variables such as gross domestic product, revenue expenditure on health, capital expenditure on health, total public expenditure on health and per capita income from 2001-02 to 2022-23 in Haryana. This study investigates the relationship between total public health expenditure and economic growth in Haryana. For this purpose, data is collected from various official documents, like the government budget of Haryana and the economic survey of Haryana. After collecting data, check the unit root test used to control the stationarity of the series. If a probability distribution of a series is constant over time, the series is accepted as stationary. Dickey and Fuller (1979, 1981) developed the augmented Dickey-Fuller (ADF) test, which is mostly used as a unit root test. This test has a parametric approach and developed the Dickey-Fuller (DF) approach. The study variables are integrated of different orders, including stationary I(0) and I(1). This series was found stationary at level I(0) and I(1) in this condition study can used Autoregressive Distributed lag (ARDL) because the condition of the ARDL model is that data are stationary at level and at first difference. The ARDL model incorporates lagged values of the dependent and independent variables to capture how past influences affect current values. Through an equilibrium correction (EC) representation, ARDL models allow for the separation and estimation of both short-term and long-term impacts. The ARDL framework, particularly the ARDL bounds test, can be used to test for the existence of a stable long-run relationship between the variables.

1.6 ARDL Specification

State Gross Domestic Product = F (Total Public Expenditure on Health, Revenue Exp. on

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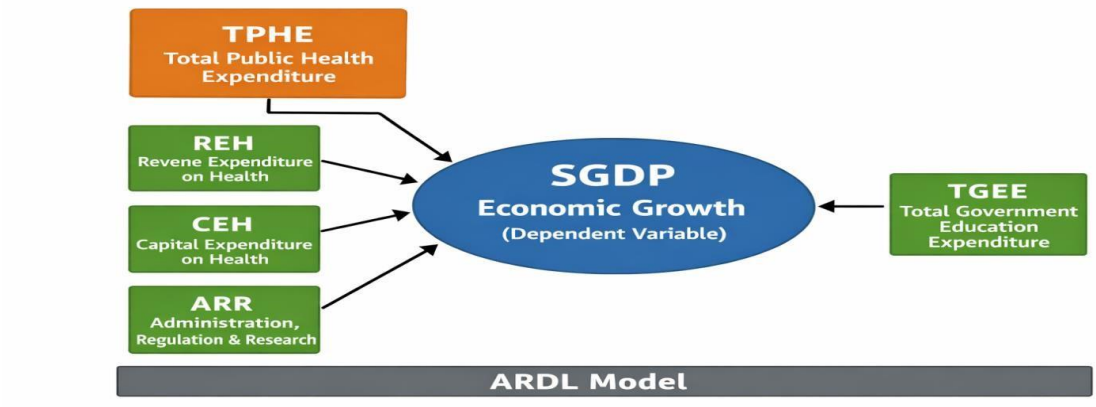
Health, Capital Expenditure on Health, Administration Regulation Research, Total Government Education Expenditure)

$$SGDP_t = a_0 + \sum_{i=0}^{n} \alpha_1 \Delta TPHE_{t-1} + \sum_{i=0}^{n} \alpha_2 \Delta REH_{t-1} + \sum_{i=0}^{n} \alpha_3 \Delta CEH_{t-1} + \sum_{i=0}^{n} \alpha_4 \Delta ARR_{t-1} + \sum_{i=0}^{n} \alpha_5 \Delta TGEE_{t-1} + \beta_1 TPHE_{t-1} + \beta_n TPHE_{t-n} + \beta_2 REH_{t-1} + \beta_n REH_{t-n} + \beta_3 CEH_{t-1} + \beta_n CEH_{t-n} + \beta_4 ARR_{t-1} + \beta_n ARR_{t-n} + \beta_5 TGEE_{t-1} + \beta_n TGEE_{t-n} + \mu_i$$

Table 1- List of Variables, Symbols and Their Descriptions

Symbol	Indicators	Variable	Data Source
SGDP	State Gross Domestic Product	Dependent Variable	Economic Survey Of Haryana (2001-2022) Https://Esaharyana.Gov.In/Economic-Survey/
TPHE	Total Public Health Expenditure	Independent Variable	Budget Of Haryana (2001-2022) Https://Finhry.Gov.In/Haryana-Budget-Archive/
REH	Revenue Expenditure On Health	Independent Variable	Budget Of Haryana (2001-2022)
CEH	Capital Expenditure On Health	Independent Variable	Budget Of Haryana (2001-2022)
ARR	Administration Regulation And Research	Independent Variable	Budget Of Haryana (2001-2022)
TGEE	Total Government Education Expenditure	Independent Variable	Budget Of Haryana (2001-2022)

Sources: The Author



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1.6.1 Unit Root Result

Before beginning on the Autoregressive Distributed Lag (ARDL) approach, the Augmented Dickey-Fuller (ADF) Test and Phillips-Perron (PP) Test have been employed to check the stationarity of the variables to avoid the problem of spurious results. To determine the order of integration, the study used the Phillips-Perron (PP) and Augmented Dickey Fuller (ADF) tests at level and at first difference. The ARDL approach cannot be employed in cases when it is integrated of order two, denoted as I(2) or when it is higher order than integrated of order one, denoted as I(1), because the computed F-statistic, as indicated by (Pesaran et al., 2001), are not valid. Further, the stationarity of the variables has been checked by utilising the ADF Test and PP Test, and the lag length has been established by the automatic lag selection criterion based on the Schwarz Information Criterion (SIC) for the ADF Test and the Newey-West Criterion for the PP Test. The Schwarz information criterion has determined the automated lag length at the level and at the first difference.

Table-2 shows the unit root result of variables

H_0: data is non- stationary,

H_1: data is stationary.

Augmented Dickey Fuller Test			
Variable Name	At Level	At First Level	Order Of Integration
SGDP	0.36**	0.03**	1(1) With Intercept
CEH	0.01***	0.00***	1(0) With Trend And Intercept
REH	0.02**	0.00***	1(0) With Trend And Intercept
TPHE	1.00	0.01***	1(1) Without Trend And Intercept
ARR	0.98	0.03**	1(1) Without Trend And Intercept
TEE	1.00	0.00***	1(1) Without Trend And Intercept

Phillips Perron Test			
Variable Name	At Level	At First Level	Order Of Integration
SGDP	0.43	0.04**	1(1) With Intercept
CEH	0.01*	0.00***	1(0) With Trend And Intercept
REH	0.04*	0.00***	1(0) With Trend And Intercept
TPHE	0.97	0.00***	1(1) With Intercept
ARR	0.97	0.02**	1(1) Without Trend And Intercept
TEE	0.99	0.00***	1(1) Without Trend And Intercept

Source: Author's calculations

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1.6.2 Empirical Testing of the Assumptions (ARDL)

The ARDL Model mainly assumes five assumptions which have been analysed as follows:

Result of Autocorrelation Test Ho – There is no Serial correlation.

Table 3: Result of Autocorrelation Test - Breusch – Godfrey Serial Correlation Test

F-Statistics	0.89
P-Value	0.45
Obs R-Squared	4.05

Source: Author's calculations.

Indicate significance at the 5 percent level

Autocorrelation refers to correlation among residuals in a regression model, which can make estimates inefficient and distort statistical tests. Since the p-value (0.45) is greater than 0.05, we fail to reject the null hypothesis of the Breusch–Godfrey test. In this analysis, the F-statistic (0.89) and its p-value (0.45) indicate that we fail to reject the null hypothesis of no autocorrelation. This means the residuals are not significantly correlated over time. The Rsquared value from the auxiliary test also supports the absence of serial correlation. Overall, the model does not suffer from autocorrelation, making the coefficient estimates more reliable, though other diagnostic checks should still be performed to confirm overall model validity.

Result of Heteroskedasticity Test

Ho – The Residuals are Homoscedastic

Table 4: Result of Heteroskedasticity Test - Breusch–Pagan–Godfrey

F-Statistics	0.78
P-Value	0.64
Obs R-Squared	9.32

Source: Author's calculations.

** Indicate significance at the 5 percent level.

The heteroskedasticity test checks whether the residuals have constant variance. In this analysis, the p-value is 0.64, which is much higher than standard significance levels. Therefore, we fail to reject the null hypothesis of homoskedasticity, indicating no evidence of heteroskedasticity in the model. The F-statistic (0.78) and R-squared value also support this conclusion. This means the residuals have constant variance, and the regression estimates are efficient and reliable.

1.6.3 Ramsey RESET Test

The Ramsey Regression Equation Specification Error Test (RESET) is employed to examine whether the functional form of the estimated model is correctly specified and whether any relevant variables have been omitted.

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H_0 (Null hypothesis): The model is correctly specified (no omitted variables or functional form misspecification).

Table 5: Result of Ramsey RESET Test

	Value	Pro.
F-Statistics	3.27	0.099
Likelihood Ratio	13.2	0.001

Source: Author's calculations.

** Indicate significance at the 5 percent level.

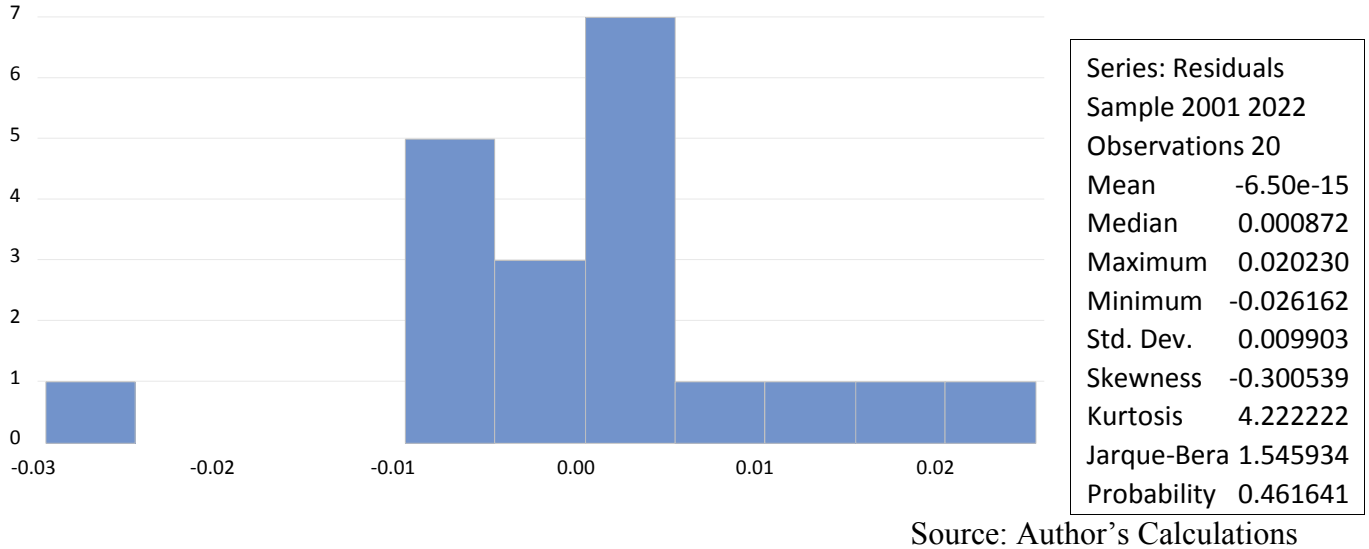
Based on the F-statistic**,** the p-value (0.0993) is greater than 0.05 but less than 0.10. This indicates that the null hypothesis of correct model specification cannot be rejected at the 5 per cent significance level. Although the likelihood ratio statistic is statistically significant, standard practice in ARDL diagnostics places greater emphasis on the F-statistic of the RESET test. Therefore, the overall evidence points to a reasonably well-specified model. The Ramsey RESET test results indicate that the model is correctly specified, as the null hypothesis of no functional form misspecification cannot be rejected at the 5 per cent level (F = 3.27, p = 0.099). This confirms the adequacy of the estimated ARDL model.

1.6.4 Result of Normality Test

Ho – The Residuals are distributed normally.

H_1 – The Residuals are not distributed normally.

Figure1:Result of Normality Test - Jarque – Bera test



Source: Author's Calculations

The histogram and statistics indicate that the residuals are approximately normally distributed. The mean of residuals is approximately zero (-6.5e-15), which satisfies a key OLS/ARDL assumption, skewness (0.30) is minimal, and residuals are slightly left-skewed, but very close to symmetry, and kurtosis (4.22) is higher than 3, indicating a leptokurtic distribution (slightly heavy tails). The Jarque–Bera test gives a statistic of 1.54 with a p-value of 0.46, so we fail to

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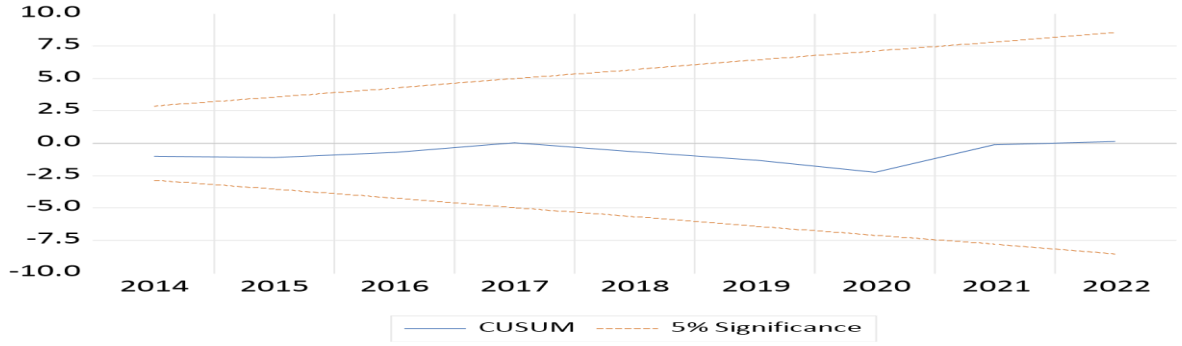
reject the null hypothesis of normality. This means the residuals show no major skewness, outliers, or heavy tails, confirming that the normality assumption holds and supporting the reliability of the model's inference. The residuals are normally distributed, and this supports the validity of t-statistics, F-statistics, and bounds testing in the ARDL model.

1.6.5 Stability Test (Cusum Test)

CUSUM test result shows the line stays within 5% critical bounds so model is stable over time. If it crosses the bounds it shows model instability.

H_0: Model parameters are stable.

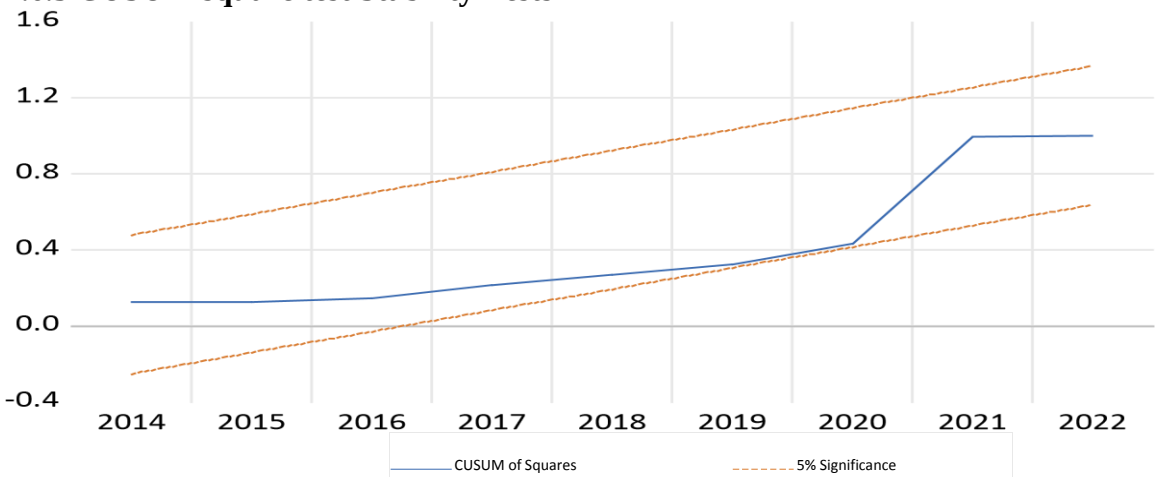
H_1: Model parameters are unstable.



Source: Author's Calculations using Eviews.

The CUSUM (Cumulative Sum) stability test is used to determine whether the parameters of the estimated model remain stable over time. In the given plot, the CUSUM line (blue) remains within the 5 per cent significance level boundaries (dashed orange lines) throughout the sample period. This suggests that the estimated regression model is stable, with no significant structural breaks over time. Since the CUSUM line does not cross the critical bounds, the model's coefficients remain consistent and reliable across the sample. This strengthens the validity of the long-run and short-run relationships obtained from the ARDL model, indicating that the relationship between SGDP, REH, CEH, TEE, TPHE and ARR has not undergone major shifts. Overall, the results confirm that the model is well-specified and does not suffer from instability, making it suitable for policy recommendations and forecasting. However, further diagnostic tests, such as the CUSUMSQ test, can be conducted to double-check stability in variance terms.

1.6.5 CUSUM square test Stability Tests



Source: Author's Calculations using Eviews.

The CUSUM of Squares test is used to assess the stability of variance in a regression model over time. If the cumulative sum remains within the 5% significance boundaries, the model is considered structurally stable. In this case, the test initially indicates stability, as the CUSUM line remains within the critical bounds. The blue CUSUMSQ line remains within the 5% significance (critical) bounds throughout the sample period (2014–2022). Although there is a noticeable upward movement around 2020–2021, the line does not cross the upper or lower critical bounds**.** The stability of the ARDL model was examined using the CUSUM and CUSUM of Squares tests. The results indicate that the cumulative sum of recursive residuals and the cumulative sum of squares remain within the 5% significance bounds throughout the sample period, confirming the stability of the estimated coefficients and the absence of structural breaks. If the line were to cross the boundary, it would confirm a structural break in the model. The results indicate that while the model appears stable for most of the period, there may be some degree of variance instability towards the end.

1.6.6 Bound Cointegration test

The bound cointegration test result indicates a long-run relationship exists if the calculated Fstatistic is greater than the upper bound critical value, or that no long-run relationship exists if it's below the lower bound critical value. If the F-statistic falls between the upper bounds and lower bound, the result is inconclusive and further testing is needed. The long-run coefficients are then estimated using the ARDL model, once cointegration is established.

1.6.7 Result of Bound Test

The following results have been derived from data analysis:

Table 6: Result of F-Bound Test

F-Value/ Wald Statistics	Significance (%)	I(0)	I(1)
16.970*	10	2.08	3
	5	2.39	3.38
	2.5	2.7	3.73
	1	3.06	4.15

Source: Author's calculations.

The F-Bound Test, developed by Pesaran et al. (2001), is used to determine whether there is a long-run relationship between the dependent and independent variables in an ARDL model. The test compares the calculated F-value (16.970) against the critical bounds I (0) and I (1) at different significance levels.

Long-run relationship exists: If the F-statistic is greater than the upper bound critical value, reject the null hypothesis and conclude there is a long-run cointegrating relationship.

No long-run relationship exists: If the F-statistic is less than the lower bound critical value, you fail to reject the null hypothesis and conclude there is no long-run relationship.

Inconclusive result: If the F-statistic falls between the lower and upper bounds, the results are inconclusive, and you cannot draw a definitive conclusion about cointegration.

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In this case, the F-value (16.970) is significantly higher than the upper bound I (1) at all conventional significance levels (1, 5, 2.5 and 10 per cent). This strongly suggests that there exists a long-run cointegrating relationship between SGDP and its explanatory variables. The F-Bound test confirms the existence of a long-run equilibrium relationship between SGDP and its explanatory variables. Since the F-statistic exceeds the upper bound at all significance levels, it can be concluded that the variables move together in the long run, validating the use of the ARDL model for further analysis.

1.6.8 ARDL Long Run

The long-run estimates obtained from the ARDL model reveal a statistically significant relationship between SGDP and the selected explanatory variables, namely TPHE, REH, CEH, ARR, and TGEE.

Table 7: Long-run Relationship between Variables (Level Equation)

Variable	Coefficient	T-Statistics	P-Value
$TPHE_t$	17.86	3.02	0.01***
REH_t	-15.46	-2.92	0.01***
CEH_t	-0.985	-2.47	0.03**
ARR_t	-0.970	-3.63	0.00***
$TGEE_t$	0.26	1.12	0.28
C	-1.19	-2.68	0.02**

Source: Author's calculations

(Indicate significance at 5 percent level)

This table presents the results of the long-run relationship between several variables based on the level equation in an econometric model. Here's an interpretation of the findings:

The long-run ARDL results offer valuable insights into the relationship between SGDP and its explanatory variable. The coefficient of total public health expenditure (TPHE) **is** positive (17.86) and statistically significant (0.01) at the 5% level. This indicates that an increase in public health expenditure has a favourable impact on economic growth in the long run. Specifically, a one-unit increase in TPHE leads to an increase of 17.86 units in SGDP ceteris paribus. This finding supports the view that sustained investment in public health enhances labour productivity and long-term economic performance. The positive and statistically significant coefficient of total public health expenditure suggests that increased public investment in healthcare improves population health outcomes and labour productivity, thereby fostering long-run economic growth.

Revenue expenditure on health (REH) exhibits a negative (-15.46) and statistically significant (0.01) coefficient. The long-run estimate suggests that a one-unit increase in REH reduces SGDP by 15.46 units in the long run. This may reflect inefficiencies in recurrent health spending that do not translate into productive capacity or long-term growth. Several factors can explain this outcome. First, revenue expenditure largely consists of wages**,** salaries, administrative costs, subsidies, and routine maintenance, which primarily support consumption rather than productive investment. Second, higher REH may reflect inefficiencies and leakages

in public health administration, such as overstaffing, bureaucratic inefficiency, or misallocation of funds.

Similarly, capital expenditure on health (CEH) has a negative (-0.98) and significant (0.03**) long-run coefficient. The result implies that a one-unit increase in CEH decreases SGDP by 0.99 units, indicating that capital investments in health infrastructure may suffer from delayed returns, inefficiencies, or misallocation during the study period. The negative and statistically significant coefficient of capital expenditure on health (CEH) suggests that increased investment in health infrastructure has not translated into long-run economic growth during the study period. Several structural and institutional factors may explain this result. Capital expenditure on health often involves long gestation periods. Investments in hospitals, medical colleges, and large health infrastructure projects take considerable time to become operational and generate productivity gains. During the estimation period, the economic benefits of such investments may not have fully materialised, resulting in a negative long-run association. The effectiveness of capital health spending depends on complementary inputs, such as trained medical personnel, medicines, and efficient management. The coefficient of ARR is also negative (-0.9) and highly significant (0.00***), suggesting that a one-unit increase in ARR leads to a 0.97-unit decline in SGDP in the long run. This indicates that rising ARR may impose fiscal or administrative burdens that adversely affect economic growth. The negative and highly significant coefficient of ARR indicates that increases in ARR are associated with a decline in economic growth in the long run. This relationship can be explained through several economic and institutional mechanisms. First, a rising ARR often reflects an increase in fiscal or administrative burden on the economy. Higher ARR may divert government resources toward non-productive or compliance-related activities, reducing funds available for growthenhancing investment in health, education, and infrastructure. Second, an increase in ARR may lead to resource misallocation, particularly if the revenues or regulatory mechanisms associated with ARR discourage private sector activity.

Total government education expenditure (TGEE) suggests that government spending on education has a growth-enhancing direction, but its impact is not strong enough to be statistically confirmed in the long run during the study period. Education expenditure typically involves long gestation periods. Investments in education yield returns only after several years, once students enter the labour market with enhanced skills. As a result, the long-run growth effects may not be fully captured within the sample period, leading to statistical insignificance. The effectiveness of education spending depends heavily on quality, efficiency, and outcomes, rather than the level of expenditure alone.

Lastly, the constant term (C) is statistically significant at the 5% level (p-value = 0.02), with a negative coefficient of −1.19 and a t-statistic of 2.68. This indicates that, when all explanatory variables are held constant (or at zero), the dependent variable is expected to decline by about 1.19 units in the long run. The statistical significance of the constant suggests that there are other omitted or unobserved structural factors, such as institutional quality, demographic changes, technological progress, or policy influences, not explicitly included in the model. Theoretical Frameworks and Empirical Evidence: Human Capital Theory (Mushkin, 1962): Mushkin was among the first to argue that "health is an investment." Much like education, health spending creates a stock of human capital that yields returns over time by increasing the

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number of healthy working days and the cognitive/physical capacity of labor. Endogenous Growth Theory (Lucas, 1988): Lucas emphasizes that the accumulation of human capital is the primary engine of long-run growth. Public health spending ensures that this human capital does not depreciate due to illness or premature mortality. Bloom, Canning, and Sevilla (2004) found that health improvements are not just a consequence of growth but a cause, noting that a one-year increase in life expectancy can boost output by 4%. (Barro,
1990): Barro's endogenous growth model distinguishes between "productive" public services and "utility-enhancing" consumption. In many developing regions, high REH (salaries, administrative overhead) acts as a consumption good rather than a production input. (Kydland & Prescott, 1982): Capital projects like hospitals have a high "opportunity cost" during their long construction phases. Funds are diverted from the economy today, but the productivity gain (a healthier workforce) only appears years later. Agénor (2010) discusses how infrastructureled development often follows a J-curve, where growth may dip initially due to the heavy fiscal burden of capital outlays before the long-run benefits materialize. Public Choice Theory (Buchanan, 1972): This theory warns against "bureaucratic expansion," where administration departments grow for their own sake (rent-seeking), diverting funds from productive medical services. Aghion and Howitt (1992) highlight that while research is the engine of growth, the short-run cost of shifting resources into these high-gestation activities can negatively impact current output levels.

1.6.9 Short-Run Result

The short-run dynamics of the model are captured through the ARDL error-correction representation**,** which explains short-term adjustments in the dependent variable in response to changes in the explanatory variables.

Table 8: Short-Run Relationship between Variables.

Variable	Coefficient	T-Statistics	P-Value
D(TPHE)	2.20	3.50	0.00***
D(REH)	-0.12	-3.36	0.00***
D(CEH)	-0.11	-2.99	0.01***
D(ARR)	-0.12	-5.30	0.00***
CoinEQ(-1)	-0.29	-14.07	0.00***

Source: Author's calculation in E-views

Indicate significance at 5 percent level

The short-run results from the ECM regression reveal the immediate effects of macroeconomic variables on SGDP. Unlike the long-run findings, which capture the structural relationships over time, these short-run estimates indicate how SGDP responds to changes in key health expenditure within a shorter time horizon.

ΔTPHE (Total Public Health Expenditure) The coefficient of D (TPHE) is positive (2.20) and highly statistically significant ($t = 3.50$, $p < 0.01$). This implies that, in the short run, an increase

in total public health expenditure leads to a significant rise in SGDP. Specifically, a one-unit increase in TPHE increases SGDP by approximately 2.20 units, suggesting that health spending has an immediate growth-stimulating effect through higher productivity, employment generation, and increased demand in the economy. Higher public health spending immediately enhances labour productivity, reduces workdays lost due to illness, and increases demand through employment in the health sector. These effects translate quickly into economic activity, producing a short-term growth-enhancing impact.

ΔREH (Revenue Expenditure on Health): The coefficient of D (REH) is negative (−0.12) and statistically significant ($t = -3.36$, $p < 0.01$). This indicates that, in the short run, increases in revenue health expenditure reduce SGDP. This may reflect inefficiencies, administrative costs, or consumptive spending that do not immediately translate into productive capacity or growth. Revenue expenditure largely consists of salaries, administrative expenses, subsidies, and recurring operational costs, which are predominantly consumptive rather than investmentoriented. Such spending does not immediately expand productive capacity and may generate inefficiencies, thereby exerting a short-run contractionary effect on economic growth.

ΔCEH (Capital Expenditure on Health): The coefficient of D(CEH) is negative (−0.11) and statistically significant ($t = -2.99$, $p < 0.05$). This suggests that, in the short run, capital expenditure on health exerts a temporary negative effect on SGDP, possibly due to implementation lags, high initial costs, or delayed returns associated with infrastructure investment. Capital expenditure on health infrastructure involves high initial costs, gestation periods, and implementation delays. During the construction and adjustment phase, resources are tied up, and returns are postponed, leading to a temporary negative effect on economic growth despite positive long-run benefits.

ΔARR (Administration, Regulation and Research): The coefficient of D(ARR) is −0.12 and statistically significant ($t = -5.30$, $p < 0.01$), indicating that in the short run, an increase in expenditure on administration, regulation and research leads to a decline in SGDP. This suggests that such spending may involve higher bureaucratic, regulatory, or compliance costs, which can temporarily slow economic activity by diverting resources away from productive sectors. Additionally, research and regulatory expenditures often yield benefits only in the long run, and therefore may not generate immediate growth effects in the short term.

Error Correction Term (CoinEQ-1): The coefficient of CoinEQ(−1) is −0.29 and highly statistically significant ($t = -14.07$, $p < 0.01$). The negative and significant sign confirms the existence of a stable long-run equilibrium relationship among the variables. The magnitude indicates that approximately 29% of the previous year's disequilibrium is corrected within one period, implying a moderate speed of adjustment toward long-run equilibrium following shortrun shocks. Overall Conclusion: The results reveal that while total public health expenditure promotes economic growth in the short run, disaggregated spending components such as revenue and capital health expenditure may exert short-term contractionary effects. The significant and negative error correction term ensures that any short-run deviations are systematically corrected, reinforcing the stability of the model.

Theoretical Frameworks and Empirical Evidence: Bloom, Canning, and Sevilla (2004) found that health improvements are a robust predictor of economic growth. Similarly, Bhalotra (2007) argues that in developing contexts like India, even short-term public health interventions lead

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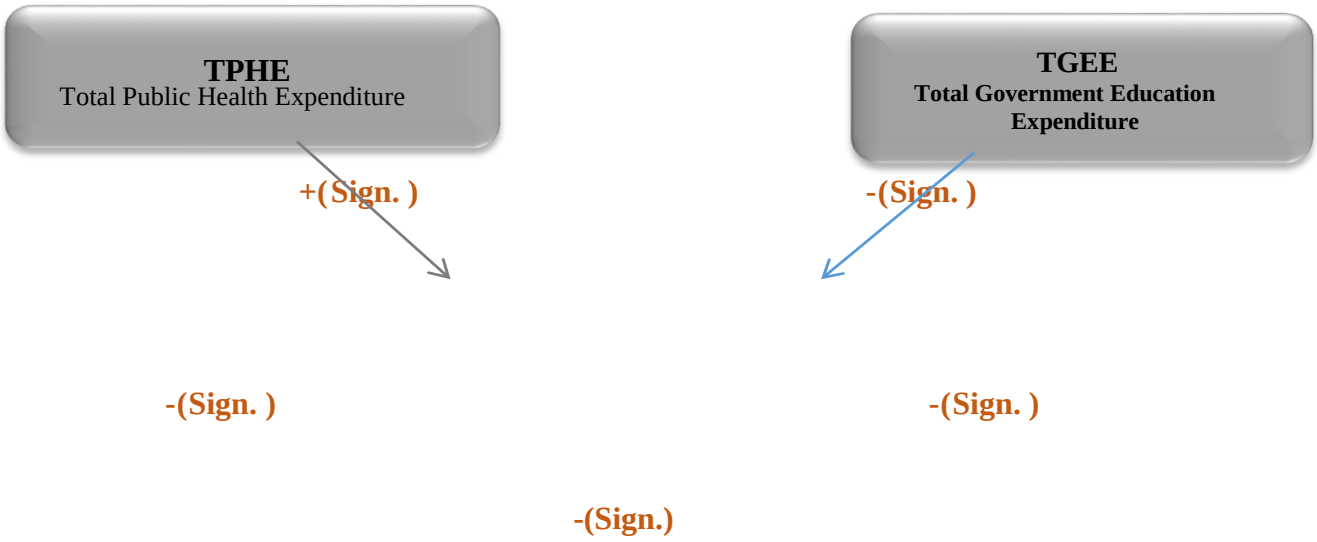
to immediate productivity gains by reducing the disease burden on the active labor force. The "Consumption Trap" in Public Finance: Revenue expenditure (salaries, administrative overhead) is often non-discretionary and consumptive. While necessary, it does not expand the physical "production frontier." High administrative costs can lead to Bureaucratic Inefficiency (Public Choice Theory), where resources are absorbed by the system rather than delivered to the public (Buchanan, 1972). Devadas and Hoon (2012) suggest that in economies with weak institutional quality, revenue-heavy health budgets can lead to a "fiscal drag," where the short-term economic cost of funding these expenditures (e.g., via taxes or debt) outweighs the immediate productivity benefits. Agénor (2010) discusses the "J-Curve" effect of infrastructure spending, where economic indicators may temporarily decline due to the significant upfront fiscal burden before trending upward as the infrastructure becomes operational. Aghion and Howitt (1992) demonstrate that shifting resources from production toward research can create a short-term contractionary effect on output, even though it is the primary engine of long-run growth. Hooda (2013) observed similar "moderate" adjustment speeds, suggesting that while health spending and SGDP are linked, institutional rigidities prevent instantaneous adjustment to shocks.



1.7 Conclusion

This study examined the relationship between public sector health and education expenditures and economic growth using the ARDL framework. The empirical results confirm the existence of a stable long-run equilibrium relationship among SGDP, public health expenditure, education expenditure, and administrative regulation research, as evidenced by the significant and negative error correction term. In the long run, total public health expenditure (TPHE) exerts a positive and statistically significant impact on economic growth, highlighting the critical role of public health investment in enhancing labor productivity, human capital, and overall economic performance. However, the composition of health expenditure matters. Revenue expenditure on health (REH) and capital expenditure on health (CEH) both exhibit negative and significant effects, suggesting inefficiencies, misallocation of resources, or delayed returns associated with these spending components. Administrative regulation research (ARR) also negatively affects growth, indicating that excessive regulatory and administrative

spending may hinder economic efficiency. Total government education expenditure (TGEE), although positive, does not show a statistically significant long-run effect, possibly due to quality concerns or time lags in realising educational returns. In the short run, changes in total public health expenditure stimulate economic growth, while changes in revenue and capital health expenditures and administrative regulation research exert a contractionary effect. Overall, the findings suggest that increasing public health expenditure can promote economic growth, but the efficiency and allocation of spending are crucial. Policy efforts should focus not only on expanding health budgets but also on improving expenditure quality, strengthening governance, and ensuring effective implementation. Enhancing the productivity of health and education spending will be essential for achieving sustained economic growth.

1.8 Policy Implications

The findings of this study carry important policy implications for promoting sustainable economic growth in Haryana through effective public expenditure management. Since total public health expenditure exerts a positive and significant impact on economic growth in both the short run and long run, the state government should prioritise increasing overall investment in the public health sector, particularly in preventive care, primary healthcare, and disease control programs that directly enhance labour productivity. However, the negative effects of revenue and capital health expenditures highlight the need to improve the efficiency and quality of spending rather than merely expanding budgets. Revenue expenditure should be rationalized by reducing administrative overheads and redirecting funds toward frontline healthcare services. Similarly, capital expenditure must be better planned and monitored to avoid delays, cost overruns, and underutilization of health infrastructure, ensuring that investments translate into tangible health and economic outcomes. The negative impact of administrative regulation research suggests that excessive regulatory and bureaucratic procedures may hinder economic efficiency. Therefore, policy reforms should focus on simplifying regulations, strengthening governance, and enhancing transparency and accountability in public expenditure management. Although education expenditure does not show a statistically significant longrun effect, its positive coefficient indicates potential growth benefits. Policymakers should emphasize improving the quality of education, skill development, and health–education linkages to maximize the long-term returns of education spending. Overall, the study underscores that effective allocation, efficient utilization, and strong institutional frameworks are crucial for ensuring that public health expenditure contributes meaningfully to economic growth in Haryana.

1.10 Limitations of the Study

The study is confined to Haryana alone it can be a comparative study of Haryana and its neighbouring states or all states in India. The period of the study from 2000-2001 to 2021-22, after the establishment of NRHM (2005) may be extended for more than the covered period. The study is also confined to selected health variables, total public health expenditure, Revenue expenditure on health, capital expenditure in health administration regulation research on health and total expenditure on education, which further opens as scope for other socioeconomic indicators for another researcher.

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