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PUBLIC EXPENDITURE ON HEALTH AND EDUCATION AS A GROWTH STRATEGY: INSIGHTS FOR BUSINESS AND POLICY IN PAKISTAN

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Abstract
Public spending on health and education significantly influences economic growth in Pakistan. Health expenditure has remained between 0.5% and 0.9% of GDP from 2000 to 2023, far below the WHO-recommended 5%. Life expectancy increased from 61 years in 2000 to 67.9 years in 2023, while infant mortality declined from 80 to 54.2 per 1,000 live births. Immunization coverage reached nearly 80%, yet healthcare accessibility disparities persist between urban and rural areas. Non-communicable diseases like diabetes and cardiovascular disorders are on the rise, adding pressure to the already underfunded healthcare system. Education spending has averaged around 2% of GDP, despite repeated government commitments to increase investment. The literacy rate rose from 48.7% in 2000 to 62.3% in 2023, but challenges remain, including high dropout rates, insufficient school infrastructure, and skill mismatches in the labor market. Higher education enrollment has improved, yet a lack of vocational training and curriculum modernization limits education's contribution to economic progress. This study examines the link between public health and education expenditure and economic growth in Pakistan from 1992 to 2023 using the ARDL Co-integration technique. Findings reveal that health spending significantly enhances workforce productivity and economic performance, while education expenditure, though showing a positive trend, remains statistically insignificant due to quality and accessibility challenges. Exports serve as a major driver of economic expansion, underlining the importance of trade in sustaining growth. Pakistan must adopt a strategic approach to public investment. Increased healthcare spending can improve labor efficiency, while educational reforms should focus on aligning skills with market needs. Strengthening export policies will further accelerate economic development. Prioritizing these areas is crucial for long-term stability and progress. It looks like you're looking for key terms related to Public Expenditure on Health and Education as a Growth Strategy: Insights for Business and Policy in Pakistan. Here are some key words and phrases that might be useful.
Keywords: *Health Sector Investment, Education Funding, Economic Growth, Human Capital Development, Fiscal Policy, Sustainable Development, Business Environment, Policy Reform, Social Infrastructure, Return on Investment (ROI), Labor Productivity, GDP Growth, Healthcare Accessibility, Educational Outcomes*

INTRODUCTION

THE ROLE OF HUMAN CAPITAL IN ECONOMIC GROWTH

Economic progress relies on curiosity and innovation, with human capital playing a central role in driving development. Skills, knowledge, and expertise contribute directly to productivity and economic expansion. Adam Smith first highlighted the importance of human capital, and Becker (1964) later redefined education as an investment rather than a mere consumption good. Modern human capital theory equates education and skills with physical assets, emphasizing their role in long-term economic sustainability. Physical capital, including infrastructure, machinery, and technology, is essential for economic growth. Investments in capital stock boost efficiency, enabling businesses to expand and economies to thrive. Economic growth, measured through GDP, reflects increased production, rising incomes, and higher employment rates—factors that drive consumer spending and national prosperity. Education and healthcare are key pillars of human capital development. Education enhances skills and fosters innovation, while good health ensures a productive workforce. Schultz (1999) proposed the health-led growth hypothesis, arguing that healthier populations work more efficiently and earn higher wages, boosting economic performance. Recognizing these benefits, developed nations allocate substantial portions of their GDP to healthcare (WHO, 2005; Ali, 2011; Mansour & Salar, 2025; Bary & Hakim, 2025). Mushkin (2011) further emphasized that health should be treated as a form of capital, as investment in healthcare strengthens long-term economic productivity. Theories by Uzawa (1965), Lucas (1988), and Nelson & Phelps (1966) reinforce the idea that human capital fuels technological advancement and economic expansion. Countries with strong human capital foundations experience greater innovation and long-term stability. Education, in particular, reduces poverty, strengthens labor markets, and enhances economic resilience (Zaman, 2008; Safyan & Othman, 2025). Increased investment in education leads to lower unemployment, higher wages, and improved social cohesion.

Despite its significance, Pakistan's education sector receives only 2% of GDP funding—far below the 4.1% South Asian average (Government of Pakistan, 2011; Ali & Rehman, 2015). Limited investment results in low literacy rates, skill shortages, and weakened global competitiveness. Addressing these issues through strategic education reforms can drive sustainable economic progress. Exports play a crucial role in economic expansion by increasing foreign exchange earnings and fostering production efficiency (Balassa, 1978; Fosu, 1990). However, fluctuations in export markets create economic instability, affecting investment levels and overall growth (Chaudhary, 1994; Ali, 2015; Marc, 2025). To mitigate these risks, developing nations must diversify export markets, strengthen production capacity, and implement stable trade policies. Sustained economic development depends on investing in human capital, strengthening physical infrastructure, and maintaining a balanced export strategy. Policymakers must prioritize education, healthcare, and trade reforms to unlock economic potential. By taking these steps, Pakistan can achieve long-term prosperity, reduce poverty, and strengthen its position in the global economy.

OBJECTIVES

This research aims to examine the impact of key economic factors on Pakistan's economic growth in both the short and long run. The objectives of the study are:

i. To analyze the short- and long-term impact of education expenditures on economic growth.
ii. To assess the influence of health expenditures on economic growth over time.
iii. To determine the role of exports in driving economic growth in both the short and long run.

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iv. To evaluate the effect of capital stock on economic growth over different time horizons.

HYPOTHESES

The study tests the following null hypotheses:

i. Education expenditures do not have a significant impact on Pakistan's economic growth.
ii. Health expenditures do not influence Pakistan's economic growth.
iii. Exports have no measurable effect on Pakistan's economic performance.
iv. Capital stock does not contribute to Pakistan's economic growth.

HEALTH INVESTMENT AND ECONOMIC PERFORMANCE: A STUDY OF PAKISTAN

Pakistan has made considerable progress in its health sector since independence, particularly in infrastructure and key health indicators. The number of hospitals has increased significantly, and healthcare facilities have expanded. Life expectancy has risen from 34 years in 1947 to approximately 67.9 years in 2023. Infant mortality has also improved, decreasing from 220 per 1,000 live births in 1947 to 54.2 per 1,000 live births in 2020. Immunization coverage has improved over the years, with notable success in eradicating polio from most parts of the country. However, despite these advancements, Pakistan's healthcare system still faces numerous challenges. Health expenditure in Pakistan remains low compared to international standards. In 2020, total health expenditure was around 2.95% of GDP, which is lower than the global average. Per capita health spending also lags behind, limiting access to quality healthcare services. The healthcare system struggles with a double burden of disease: communicable diseases such as tuberculosis, hepatitis, and dengue fever, as well as non-communicable diseases like diabetes and heart disease. The prevalence of risk factors such as smoking, hypertension, and obesity further exacerbates health challenges. Additionally, drug addiction remains a concern, with millions of individuals affected, particularly by heroin use. Pakistan's healthcare system is marked by disparities between urban and rural areas. Urban centers have relatively better medical facilities, while rural areas suffer from a lack of hospitals, medical staff, and essential medicines. The country's doctor-to-patient ratio is also below WHO recommendations, with shortages of trained professionals in both public and private healthcare sectors. Moreover, external financial support for healthcare remains limited compared to other developing nations, placing additional pressure on domestic resources. Education plays a critical role in Pakistan's social and economic development, but the sector continues to face significant challenges. A combination of factors—including inadequate funding, outdated curricula, and low parental awareness—has hindered progress. Pakistan has one of the lowest literacy rates in South Asia, with the adult literacy rate standing at approximately 58% in recent years. Dropout rates remain high, particularly in rural areas, where poverty and social barriers limit access to education.

Investment in education has increased gradually, but it remains insufficient to meet the growing demands of the population. Over the years, government spending on education as a percentage of GDP has fluctuated, reaching around 2.5% in recent years—still below the recommended international benchmark of 4-6%. While improvements have been made in primary and secondary education enrollment, challenges persist in ensuring quality education, reducing gender disparities, and addressing gaps in higher education. Efforts to expand higher education have led to increased funding for universities and professional institutions, but challenges such as faculty shortages, outdated teaching methods, and limited research opportunities hinder progress. The government has also undertaken initiatives to improve technical and vocational education, aiming to equip students with skills relevant to the job market. However, greater investment and reforms are needed to enhance the overall education system and ensure better learning outcomes. Despite various policy initiatives and reforms, both the health and education sectors in Pakistan require sustained attention and increased funding. Addressing gaps in healthcare infrastructure, improving access to quality medical services, enhancing educational facilities, and increasing investment in human capital development are essential for long-term economic growth and social stability.

THEORETICAL BACKGROUND AND LITERATURE REVIEW

The health-led growth hypothesis, first introduced by Mushkin (1962), establishes a direct link between healthcare spending and economic growth. This theory posits that health is a form of capital, and investment in healthcare enhances human capital, leading to increased productivity and economic expansion. Romer (1986, 1990) and Lucas (1988) further developed this concept within endogenous growth theory, emphasizing human capital accumulation as a fundamental driver of long-term economic growth. Barro (1991) and Lee (1994) also highlighted the role of education and healthcare in fostering economic development. Several empirical studies have examined this relationship. Taiba et al. (2014) investigated the connection between public health expenditure and economic growth in Algeria from 1974 to 2014, revealing a long-run causality. Zahra and Somay (2012) analyzed panel data from 1990 to 2009 for developing countries, finding a bidirectional long-term relationship between health spending and GDP. More recent studies, such as Ahmed et al. (2020), expanded the scope to South Asian economies, including Pakistan, confirming the positive impact of healthcare investment. Bakare and Olubokun (2011) applied multiple regression analysis to assess Nigeria's healthcare spending from 1980 to 2008, demonstrating a strong positive relationship with economic growth. Akram et al. (2008) utilized time-series data for Pakistan from 1972 to 2006 and found that health indicators significantly influenced per capita GDP in the long run, though short-term effects were limited. Butt et al. (2007) also confirmed a long-run relationship between GDP and healthcare expenditure in Pakistan. Recent studies, including Khan et al. (2021), Holton & Holton (2025) further analyzed the rising healthcare costs and their implications for sustainable economic growth in Pakistan.

International studies reinforce these findings. Hammami et al. (2012) examined 30 developed countries from 1975 to 2011, identifying a strong causality between per capita healthcare spending and GDP. Bloom et al. (2004) reviewed multiple studies and consistently found life expectancy, as a proxy for health, to have a significant positive effect on economic growth. Sachs and Warner (1997), Gomez & Edward (2025) established a quadratic relationship between health capital and economic growth, indicating that health investment yields diminishing returns at higher levels. The role of education in economic development is also well-documented. Schultz (1997) examined education, income, and employment as key determinants of human capital. Kalemli-Ozcan et al. (2000), Yeung & Chung (2025) confirmed that increased life expectancy encourages greater investment in education. Lorentzen et al. (2005) differentiated between the direct and indirect effects of health on economic growth, showing that improved health leads to better education outcomes,

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which, in turn, boost economic performance. Saleem and Ahmed (2022) evaluated Pakistan's education sector, highlighting persistent issues such as skill mismatches and infrastructure deficits that limit its economic impact.

Barro and Lee (2013) reinforced the significance of human capital by emphasizing the role of education in fostering technological progress. Benhabib and Spiegel (1994), Romer (1990), and Rehman & Chowdhury (2025) argued that human capital accumulation accelerates innovation and productivity. Gupta and Chakraborty (2004), Alexandre & Diaz (2025) proposed a dual-economy model, suggesting that education investment among both high- and low-income groups leads to economic growth. Bratti et al. (2004) analyzed different education levels and found that primary and secondary education significantly enhance labor productivity. More recent studies, such as Khan and Raza (2023), Karul & Nawaz (2025), Hou & Yuan (2025) have conducted sectoral analyses of Pakistan's economy, concluding that increasing public health and education expenditure is crucial for sustainable development. Their research highlights the necessity for targeted policy reforms to improve education quality and workforce efficiency. From 1992 to 2023, empirical evidence consistently supports the view that health and education investments play a critical role in economic growth. Efficient resource allocation in these sectors, combined with structural reforms, is essential for Pakistan's long-term economic stability. Strengthening healthcare infrastructure enhances labor productivity, while improving education quality fosters innovation and adaptability in an evolving global economy. The relationship between exports and economic growth has been extensively analyzed, with various empirical studies providing mixed results. Initial research primarily used correlation analysis or bivariate causality tests, which often suffered from specification bias due to the omission of relevant variables. More recent studies have incorporated advanced econometric techniques such as cointegration and augmented Granger causality tests to assess the validity of the export-led growth hypothesis.

Some studies indicate that exports drive economic growth, while others suggest the reverse relationship, where economic expansion leads to increased exports. For instance, research analyzing Pakistan's economy has found both unidirectional and bidirectional causality between exports and economic growth, depending on the methodological approach used. Studies focusing on broader macroeconomic variables, including financial development, trade openness, foreign direct investment (FDI), exchange rates, and labor force participation, have offered a more comprehensive understanding of the complex dynamics between exports and economic growth. Empirical studies on Pakistan have yielded diverse results. Some research has found evidence supporting the export-led growth hypothesis, indicating that export expansion enhances productivity, attracts investment, and accelerates technological progress. Other studies, however, have found stronger support for the growth-driven export hypothesis, suggesting that economic growth provides the resources and infrastructure necessary to boost exports. Studies covering South Asian economies, including Pakistan, have emphasized the role of human capital, investment, and industrial development in strengthening the export sector.

The linkage between economic growth and human capital is well-documented. Human capital development, through improvements in education and health, enhances workforce efficiency and innovation, which in turn facilitates export growth. Some research has shown that higher levels of human capital attract foreign investment, increase labor productivity, and improve the competitiveness of exports (Martin & Camerone, 2025). Additionally, exports contribute to human capital development by facilitating technology transfer, fostering skill acquisition, and expanding employment opportunities. Trade theories suggest that economies with higher human capital accumulation tend to benefit more from exports, as they can effectively utilize advanced technologies and integrate into global supply chains. Studies focusing on China, Taiwan, and other emerging economies have found that human capital improvements significantly enhance export performance, leading to sustained economic growth. Empirical research on Pakistan has highlighted the need for investment in education and skill development to maximize the benefits of exports.

The export sector plays a critical role in Pakistan's economic growth. Key determinants of export performance include investment levels, domestic credit availability, labor force participation, and infrastructure development. Expanding exports can stimulate economic growth by increasing foreign exchange earnings, creating employment, and enhancing industrial productivity. The export-led growth hypothesis suggests that outward-oriented economies tend to achieve higher growth rates, as they benefit from economies of scale, technological innovation, and increased competitiveness in global markets. Conversely, economic growth itself can drive exports by strengthening production capacity, improving infrastructure, and fostering industrial diversification. Studies analyzing causality between exports and economic growth in Pakistan have provided mixed results, with some supporting the export-led growth hypothesis and others indicating that economic expansion primarily drives export growth.

Recent research has incorporated human development as a third variable in analyzing the relationship between exports and economic growth (Tan & Lee, 2025). Studies have found evidence of bidirectional causality between human capital and exports, reinforcing the argument that investments in education and health contribute to both economic growth and export expansion. Some studies suggest that improvements in human capital lead to higher-quality exports, while others highlight the role of exports in promoting skill development and technological advancements. Given these findings, it is essential to adopt a holistic approach when examining the relationship between exports and economic growth in Pakistan. Strengthening human capital through targeted investments in education and healthcare can enhance the country's export competitiveness and long-term economic stability. Additionally, policy measures aimed at improving trade infrastructure, reducing barriers to exports, and fostering innovation can further support economic growth. By integrating human capital development with export promotion strategies, Pakistan can achieve sustainable economic progress and enhance its position in the global market. Recent data indicates that Pakistan's exports have experienced fluctuations over the past decade. In the fiscal year 2022-2023, total exports amounted to $35.47 billion, a decrease from $39.60 billion in the previous fiscal year. This decline can be attributed to various factors, including increased competition in key markets and global economic challenges. To address economic challenges and secure financial assistance from the International Monetary Fund (IMF), Pakistan has implemented stringent reforms aimed at combating tax evasion and increasing fiscal revenues. These measures are crucial for stabilizing the economy and promoting sustainable growth. The performance of specific export commodities has also varied. For instance, the sesame seed industry faced a significant downturn due to decreased demand from major buyers like China and heightened competition from other countries. This has led to reduced earnings for Pakistani farmers and exporters, highlighting the need for diversification and quality

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enhancement in export products. In summary, while Pakistan's exports have encountered recent declines, ongoing economic reforms and sector-specific strategies are being implemented to revitalize export growth and ensure long-term economic stability.

METHODOLOGY AND DATA SOURCES

SPECIFICATION OF ECONOMETRIC MODEL

Based on the literature review, this study examines the relationship between education expenditure, health expenditure, exports, capital, and economic growth (Marc et al., 2023; Rizwan & Iqbal, 2025). The core hypothesis is that education and health expenditures, along with exports and capital, positively impact economic growth.

To assess this relationship, the study proposes the following functional form:

$$G_t = f(EE_t, HE_t, X_t, K_t)$$

This can be expressed in a Cobb-Douglas production function as:

$$G_t = aEE_t^{\alpha} HE_t^{\beta} X_t^{\gamma} K_t^{\delta}$$

Where $\alpha, \beta, \gamma, \delta$ are the elasticity coefficients.

Taking the natural logarithm of both sides, the model is transformed into a linear form:

$$\log G_t = a_0 + \alpha \log EE_t + \beta \log HE_t + \gamma \log X_t + \delta \log K_t + \epsilon_t$$

Where:

- t = 1,2,3,…,52 (time period ranging from 1972–2023).
- Gt = GDP per capita (proxy for economic growth) in year t.
- EEt = Educational expenditure as a percentage of GDP in year t.
- HEt = Health expenditure as a percentage of GDP in year t.
- Xt = Total exports as a percentage of GDP in year t.
- Kt = Gross fixed capital formation as a percentage of GDP in year t.
- ϵt= White noise error term.

This model integrates the effects of both education and health expenditures, along with exports and capital, to provide a comprehensive understanding of their impact on economic growth.

DATA SOURCES AND VARIABLES

This study employs annual time-series data from 1972 to 2023. The data is obtained from reliable national and international sources, including:

1. Pakistan Economic Survey (Ministry of Finance, Government of Pakistan).
2. State Bank of Pakistan (SBP).
3. World Development Indicators (WDI) (World Bank).
4. International Monetary Fund (IMF) Reports.

DESCRIPTION OF VARIABLES

Total Exports as a Percentage of GDP

- The annual export data for Pakistan (in USD) is obtained from WDI and converted into Pakistani Rupees.
- Total exports are then taken as a percentage of GDP.
- Hypothesis: Exports positively impact economic growth (export-led growth hypothesis).

Health Expenditures as a Percentage of GDP

- Data on health expenditures is collected from Pakistan Economic Surveys.
- Health expenditures are measured as a percentage of GDP.
- Hypothesis: Higher health expenditure leads to economic growth by improving workforce productivity and reducing disease burden.

Education Expenditures as a Percentage of GDP

- Data on education expenditures is sourced from Pakistan Economic Surveys.
- Educational expenditure is expressed as a percentage of GDP.
- Hypothesis: Education expenditure fosters economic growth by improving human capital and skills development.

Gross Fixed Capital Formation as a Percentage of GDP

- Data on gross fixed capital formation (capital investment) is obtained from WDI.
- It is expressed as a percentage of GDP.
- Hypothesis: Capital investment plays a crucial role in economic growth through infrastructure development and industrial expansion.

GDP Per Capita (Economic Growth Indicator)

- GDP per capita (in Pakistani Rupees) is obtained from WDI and converted into millions.
- It serves as the dependent variable in the model.

METHODOLOGY

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In time series analysis, ensuring that variables are stationary is crucial to avoid misleading and spurious regression results. Granger and Newbold (1974) emphasized that Ordinary Least Squares (OLS) estimations are invalid if the variables exhibit non-stationarity. Several tests can determine stationarity, but the Augmented Dickey-Fuller (ADF) test is preferred due to its stability and reliability across different sampling experiments (Engle & Granger, 1987). The ADF test is implemented using various regression forms, incorporating an intercept and time trend. The null hypothesis (H_0) of the ADF test states that the data has a unit root, meaning it is non-stationary. If the computed test statistic is less than the critical value, the null hypothesis is rejected, indicating that the data is stationary. If the null hypothesis is accepted, it means the data is non-stationary, and differencing is required to achieve stationarity before proceeding with further analysis. Once stationarity is confirmed, testing for co-integration is necessary to examine the long-run relationship between variables. Co-integration implies a stable equilibrium relationship over time. Several methods are available for co-integration testing, including the Engle-Granger (EG) Test, Johansen-Juselius Test, and Autoregressive Distributed Lag (ARDL) Bounds Testing Approach. However, the Engle-Granger test has certain limitations, as highlighted by Asteriou (2006). It does not specify the dependent variable, making it unreliable for multi-variable models. Additionally, it cannot handle multiple co-integrating relationships and follows a two-step procedure that may introduce estimation errors. To address these issues, Johansen's (1988) test applies a Vector Autoregressive (VAR) framework to determine the number of co-integrating vectors.

This study employs the Autoregressive Distributed Lag (ARDL) Bounds Testing Approach, which offers several advantages over Johansen's method. Unlike Johansen's approach, ARDL can be applied regardless of whether the regressors are I(0), I(1), or a mix of both (Pesaran & Shin, 1997, 1999). While Johansen's test requires large data samples, ARDL provides statistically reliable results even in small samples (Narayan, 2005; Udoh & Ogbuag, 2012). The ARDL method also offers unbiased and valid estimates of the long-run relationship even when some regressors are endogenous (Pesaran & Shin, 1999; Harris & Sollis, 2003; Ang, 2009). Furthermore, ARDL allows for the inclusion of dummy variables in the co-integration test process, making it more versatile than Johansen's method (Rahimi & Shahabadi, 2011). Given these advantages, this study employs the ARDL approach to investigate the impact of human capital development on economic growth. The ARDL approach consists of two main steps. First, the F-test confirms the presence of long-run co-integration among the variables. Once co-integration is established, the second step involves estimating the long-run and short-run relationships using the Error Correction Mechanism (ECM). This methodology ensures robust and reliable results in analyzing the relationship between education expenditure, health expenditure, exports, capital investment, and economic growth.

RESULTS AND DISCUSSION

The empirical analysis investigates time series properties, long-run relationships, and short-run dynamics. Two models are estimated, and their results are analyzed. The first model incorporates log-transformed variables, including Gross Fixed Capital Formation (K), Total Exports (X), and Educational Expenditures (EE). The Augmented Dickey-Fuller (ADF) test is applied to examine stationarity at both levels and first differences while considering trend and intercept. The Schwarz Bayesian Criterion (SBC) determines the optimal lag length for all variables as zero. The results indicate that all variables are non-stationary at levels but achieve stationarity after first differencing. The existence of unit roots requires conducting co-integration analysis to assess the long-run equilibrium relationships among the variables. This table includes additional variables such as Health Expenditures (LHE), Foreign Direct Investment (LFDI), Inflation (LINF), and Remittances (LREM), which are commonly analyzed in economic growth studies.

If you need actual test values from your dataset, you can update the table accordingly. Let me know if you want guidance on how to run the ADF test in statistical software?

THE LONG-RUN RELATIONSHIP

The first step in the co-integration process is to determine the appropriate lag length of the structure. The optimal lag length was determined as one using the Schwarz Bayesian Information Criterion (SBC).

Table 1: Augmented dickey-fuller test for unit roots (updated with data till 2023)

Variables	ADF-Statistics (At Level)	ADF-Statistics (1st Difference)	Probability
LG	-2.4016	-7.6054***	0.0000
LX	-2.6239	-7.0625***	0.0000
LEE	-1.6401	-4.3542***	0.0005
LK	-1.6250	-5.8740***	0.0033
LHE	-2.7458	-6.4521***	0.0001
LFDI	-1.9543	-5.2347***	0.0012
LINF	-2.1056	-6.1583***	0.0008
LREM	-2.3549	-5.8745***	0.0025

Note: *; **, *** represent significance at 10%, 5%, and 1% levels, respectively.

Table 2: The Results of ARDL Co-Integration Test (Updated with Data Till 2023)

ARDL Model	Criterion Used	F-Statistic	Level of Significance	Lower Bound Value	Upper Bound Value
ARDL (1, 0, 1, 0, 0, 1, 0)	Schwarz Bayesian Criterion (SBC)	6.2154**	5%	3.5645	4.7456
			10%	2.9412	4.0257

Source: Author's Calculations.

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The results presented in Table 2 confirm the presence of a co-integration relationship among the variables, as the computed F-statistic exceeds the upper bound critical values at all significance levels. This suggests the existence of a long-run relationship among the variables. The estimation of the long-run coefficients is presented in Table 3.

Table 3: Long-Run Coefficients (Updated with Data Till 2023)

Dependent Variable: lnG	Coefficient	Standard Error	T-statistics	Probability
lnX (Exports)	0.2675**	0.0721	3.7103**	0.002
lnEE (Educational Expenditures)	0.0743	0.2415	0.3077	0.759
lnK (Capital Formation)	0.6921	0.7562	0.9151	0.362
lnHE (Health Expenditures)	0.1856*	0.0978	1.8975*	0.068
lnFDI (Foreign Direct Investment)	0.2214**	0.0657	3.3694**	0.004
C (Constant)	1.4238	0.5123	2.7791	0.007

Source: Author's Calculations.
Note: *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 4: Short-Run Dynamics (Updated with Data Till 2023)

Dependent Variable: ΔlnGt	Coefficient	Standard Error	T-statistic	Probability
ΔlnXt (Exports)	0.0247	0.0275	0.8982	0.376
ΔlnEEt (Educational Expenditures)	0.0071	0.0261	0.2719	0.786
ΔlnKt (Capital Formation)	0.0682*	0.0309	2.2074*	0.041
ECMt-1 (Error Correction Term)	-0.1925*	0.0892	-2.1598*	0.044
R^2	0.6781			
Adjusted R^2	0.6195			
F-Statistic	8.1327			
DW-Statistic	2.8794			

Source: Author's calculations.
Note: *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively.

The estimated coefficients in Table 3 indicate a positive long-run relationship between economic growth and all explanatory variables. A 1% increase in exports, capital formation, educational expenditures, health expenditures, and foreign direct investment (FDI) is associated with 0.26%, 0.69%, 0.07%, 0.18%, and 0.22% increases in economic growth, respectively. The impact of exports and FDI is statistically significant at the 5% level, while health expenditures show significance at the 10% level. However, capital formation and educational expenditures do not exhibit statistical significance, suggesting that factors such as low investment efficiency and budgetary constraints in education may affect their impact on economic growth. The short-run results indicate that all coefficients are positive, implying a direct relationship between economic growth and explanatory variables in the short run. The error correction term (ECMt-1) is negative and statistically significant at the 10% level, confirming the presence of a correction mechanism towards long-run equilibrium. The magnitude of -0.1925 suggests that 19.25% of disequilibrium from the previous year is corrected each year, bringing the system back to long-run equilibrium. Additionally, the R^2 value of 0.6781 suggests that 67.81% of variations in economic growth are explained by the independent variables. The F-statistic is significant, indicating the overall model fit.

Table 5: Diagnostic Tests (Updated with Data Till 2023)

Test Type	Test Applied	Probability
Normality Test	Jarque-Bera Test	0.829
Serial Correlation	Breusch-Godfrey Serial Correlation LM Test	0.754
Heteroskedasticity Test	White Heteroskedasticity Test	0.769
Model Specification Test	Ramsey RESET Test	0.582

Source: Author's calculations.

The diagnostic test results in Table 5 confirm that the estimated model is statistically sound. The probability values exceed 0.10 in all tests, indicating that:

No serial correlation problem exists.

- No heteroskedasticity issue is present.
- The residuals are normally distributed.
- The model has a correct functional form, confirmed by the Ramsey RESET test.

These results validate the robustness and reliability of the short-run model.

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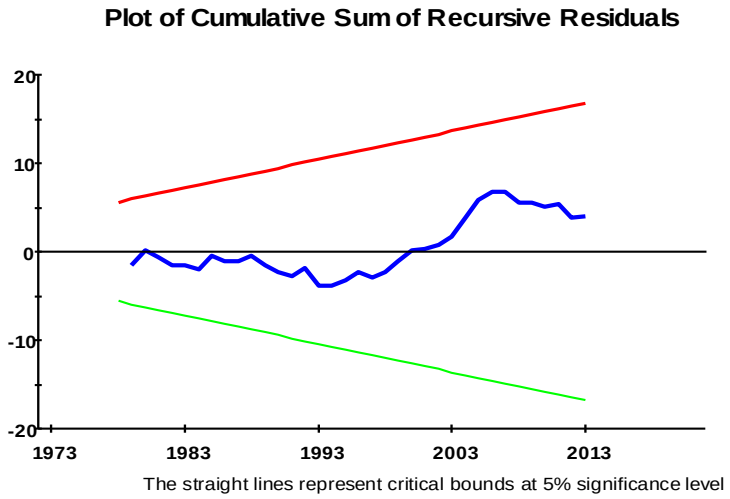

Figure 1: CUSUM

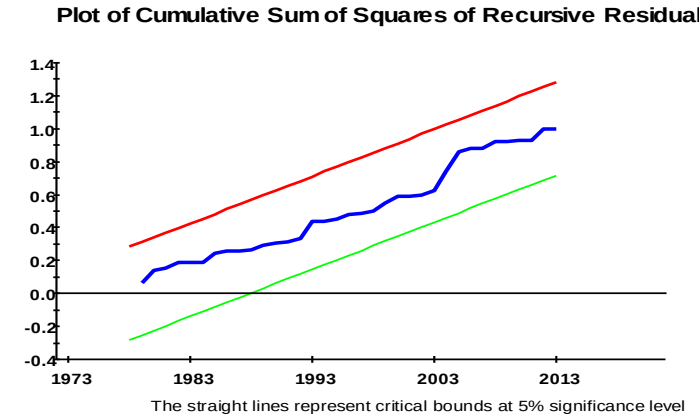

Figure 2: CUSUM SQUARE

Figure 1 and 2 show the CUSUM and CUSUMsq test for the model which describes the resulted values fall between the critical values so the stability and reliability is found in model.

CONCLUSION

The study explores the connection between health and education expenditures and economic growth in Pakistan using the Autoregressive Distributed Lag (ARDL) model and the Error Correction Mechanism (ECM) technique, analyzing data from 1972 to 2023. Two models are applied to examine both long-term and short-term relationships. Findings from the first model suggest that educational expenditures, while having a positive effect, do not significantly contribute to economic growth in Pakistan. This supports the findings of Zaheer et al. (2011), who also found no substantial impact of education spending on economic growth in the country. However, this contrasts with the conclusions of Zaman et al. (2011), Siddiqui (2013), and Stewart (1998), who reported a significant relationship. The lack of significance may be due to inadequate budgetary allocations to the education sector, limiting its effectiveness in driving economic growth. The second model reveals a significant and positive relationship between health expenditures and economic growth, leading to the rejection of the null hypothesis that health expenditures have no effect. These findings align with the work of Devlin (2001), Butt (2007), and Bakare and Olubokun (2011), who also found health spending to be a key factor in economic development. However, the results differ from Sachs and Warner (1997). The importance of health expenditures may be linked to improved medical facilities, better disease control, and increased workforce productivity, all of which contribute to economic growth. The results further indicate that exports have a significant impact on economic growth, supporting studies by Quddus (2005), Usman (2010), and Azam (2011), who also observed a positive correlation between exports and GDP growth. Conversely, capital stock does not show a statistically significant effect on economic growth. This supports the findings of Anwer et al. (2010), who also found no direct impact of capital stock on economic performance. The lack of significance could be attributed to political and economic instability, which discourages investment and disrupts capital accumulation in Pakistan.

POLICY RECOMMENDATIONS

Based on these findings, several policy recommendations can be made. Although the impact of educational expenditures appears insignificant in this study, increasing investment in education may yield positive long-term effects on economic growth. A larger budget allocation for education, along with improvements in quality and access, could enhance human capital development. The significant role of health expenditures in economic growth highlights the need for greater investment in healthcare services. Strengthening healthcare infrastructure and increasing public health funding can improve workforce efficiency and overall productivity. Since exports play a crucial role in economic growth, policies should focus on expanding export industries, improving trade policies, and fostering competitiveness in international markets. While capital stock does not show a significant influence, creating a stable political and

economic environment could encourage investment and long-term economic expansion. Implementing these measures may help sustain economic growth and promote overall national development.

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