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Public Spending Composition and its Implications for Economic Growth and Poverty Reduction in Pakistan: A Dynamic Time Series Analysis

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ABSTRACT

This study explores the dynamics of government spending composition in Pakistan, focusing on its impact on economic growth and poverty reduction. The study analyzes subcategories of public expenditures, including current and capital spending, and functional classifications such as education, health, physical infrastructure, and defence. Using the ARDL framework, the study finds a long-run relationship between public spending and economic growth, with capital spending positively impacting GDP growth while current expenditures have a negative effect. Education and physical infrastructure expenditures contribute positively to economic growth, while health expenditures negatively impact the long run. The study also disaggregates health and education expenditures to analyze their economic impacts. Expenditures on research and curriculum development in education and subsidiary transportation services positively affect economic growth. However, primary and secondary education expenses and tertiary education expenditures do not show a significant growth impact. Similarly, expenditures on hospital services, patient health services, and research and development in health do not contribute to economic growth. The study concludes that the composition of public expenditures is related to poverty reduction, with total government spending and investments in education, health, and physical infrastructure playing a significant role in poverty reduction.

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1. Introduction

Government expenditures in developing nations typically account for between (15-30 %) of GDP minor modifications in the composition of the mix of public spending could have a most important impact on GDP and the execution of the government's intentions. Expenditures by governments, especially in developing economies, are vital since such spending by the government provides a channel for boosted economic growth. Many remarkable studies such as Elías (1985); Shenngen Fan, Hazell, and Haque (2000); Shenggen Fan, Jitsuchon, and Methakunnavut (2004); Shenggen Fan and Rao (2003) have contributed to establishing the positive link between public spending production growth and poverty reduction while these studies were concerned with the intervention by the government in the economic development. Several other studies have focused on the correlation between the role of government expenditure and economic evolution, notably, authors such as Bose, Haque, and Osborn (2007); Devarajan, Swaroop, and Zou (1996) have found a positive impact of public spending composition and economic growth. As we know, the composition of government spending is a public problem, and therefore, it is openly discussed on the grounds of policy implication, several researchers have presented the concept of developmental and non-developmental public spending and indicated how an economy can expand its outcome by shifting the structure of these two extreme levels? Many developing economies must face very rigid fiscal limitations. That is, which constituent of the public spending should be amended?

Infrastructure? Education? Defence? Health? Or current or capital? To boost the economy. The answer is to hang on to the involvement of these components of government expenditures in economic growth.

Thus, the primary purpose of this study is to find a correlation between those components of public expenditures that impact economic development and lead to poverty reduction, with particular reference to Pakistan. We have focused on growth because this is one of the main objectives of any government, and it would be a source of valuable information to know about the involvement of various constituents of the public expenditures to this objective, to assess the cost of pursuing the other goals. The analysis of the public policy literature has proven that neither the theory nor the empirics provide a rich solution to the question of how the government's spending composition paves the way for the economy to grow. Based on the theory, we can develop a base for the government to interfere in the market to address market failure and provide goods and services. Government involvement can also be justified because it can take on the externalities and ensure the cost in the presence of significant economies of scale in the market. Similarly, there is a justification for government intervention in the related market when there is market failure in one market. The theoretical notion cannot be translated into operational rules and is not as easy as it sounds. Sometimes, deciding which module of the public expenditure should be reduced and which should be appreciated in the budget share becomes an obstacle for policymakers. On an empirical basis, very few researchers have tried to link government expenditures to economic growth and their implications for poverty reduction. However, it lacks sound theoretical work if we analyse the public policy issue research (Diamond, 1989).

In the latest empirical work by D. A. Aschauer (1989); Holtz-Eakin (1991); Morrison and Schwartz (1992) on the issue of the public expenditures composition, these researchers have provided a sound theoretical base for their empirical work, but they have mainly focused on the output of the public expenditures components in the United States. This research has tried to define which component of public expenditure contributes to economic growth and has implications for poverty reduction. On one side, we have expenditures based on economic classifications, which are current and capital expenditures. Conversely, we have expenditures according to the functional classification: defence, health, transportation, communication, and government spending on education. In this document, after analyzing the impacts of public spending on the various components, the two main sectors of the economy are. That is the health and education. It has been generally believed that if some component of public spending is unproductive, then there might be some composition of that specific variable that is productive or unproductive. Therefore, the two sectors have been discussed in depth. The distortions in the economies have been measured by the two variables, namely the shock and premium, in the black market to accurately assess the direct impacts of public spending. Hence, the study will focus on the allocation of government expenditure, specifically in Pakistan. The study will investigate the empirical correlation between the design of public spending and its impact on growth and poverty alleviation. Hence, the study inquiry will center on these matters, namely, if the composition of public expenditures impacts economic growth and if it has consequences for poverty alleviation. This analysis aims to investigate the relationship between public spending and economic growth. Specifically, we will determine the circumstances in which the allocation of public funds can result in a greater long-term growth rate. The primary aim of the study is to establish the correlation between different elements of government spending and economic growth, and to deduce the consequences for both short-term and long-term growth and poverty alleviation. The study will analyze the correlation between the composition of public spending and development objectives, such as economic growth and the alleviation of poverty.

Following the modelling methodology of Devarajan, Swaroop, and Zou (1996), it has been tried to discuss a model in which the government undertakes expenditures on health, education, infrastructure, defence of the shock variable to capture the fluctuations in the economy, and the black-market premium to capture the deterioration in the capital markets. The study is novel in that it is the first empirical inquiry into the composition of public spending that studies the subcategories and draws implications for each set. This is also novel in another way that it uses the sound theoretical model and develops an index of black-market premium for the shocks in the capital market to draw pure impacts of the spending composition. The study has been organized as follows: the next chapter is on the detailed literature review. Chapter 3 is about the exploratory analysis of the state of the government spending over time. Chapters 4 and 5 present the theoretical and empirical model of the study, and then there is a chapter comprising a discussion and conclusion.

2. Literature Review

The issue of the composition of public spending and its implication for economic growth and poverty reduction has been investigated by various researchers. Many researchers have tested this topic with cross-sections and individual analyses and found mixed outcomes. Some believe that it has a positive link with the composition of public spending some have suggested a negative relationship, and some are inconclusive. D. Aschauer and Greenwood (1985) found government spending to be negatively correlated with the per capita growth of the economy. Also, they concluded that it provides utility to households and that to finance government expenditures, higher taxes are needed, reducing the earnings on investment and motivation to invest. Similarly, Kormendi and Meguire (1985) modelled education and defence as the government's current expenditures, hence unproductive. According to Landau (1983), there is a negative correlation between government expenditures and economic growth. He proposed that the inclusion of government spending exhibits an inverse correlation with economic growth. In 1986, Ram discovered a direct correlation between government expenditure and economic expansion, especially in emerging nations. Grier and Tullock (1989) reached a similar conclusion based on their analysis of panel data from 115 nations, which included 24 OECD countries, during the post-World War II era. He determined that there is a negative correlation between the government's consumption portion of GDP and real GDP growth. Simultaneously, it is believed that government spending on infrastructure services, which are considered as government investments, has a good correlation with economic growth. Grier and Tullock, Summers and Heston (1988) characterized defense and education spending as ineffective in their model.

In his study, Barro (1991) discovered a negative correlation between the expansion of non-productive government spending and the per capita economic growth. This conclusion was drawn on an analysis of data collected from 98 countries. He analyzed government expenditure in more detail, breaking it down into functional categories. He found that spending on education and defense has a positive effect on the country's economic performance. Easterly and Rebelo (1993) conducted a cross-country regression analysis on 100 countries between 1970 and 1988. Their findings indicate that increased public expenditure on transportation and communication in emerging nations is associated with a rise in economic growth. Swaroop and Devarajan, Swaroop, and Zou (1996) established a direct relationship between per capita GDP growth and spending on transportation and communication. However, their study found that spending on health and education had a negative impact on economic growth. Defense expenditures were found to be insignificant, while recurrent public spending had a positive effect on economic growth. Additionally, capital expenditures were found to be negatively correlated with per capita GDP growth. These findings were based on data from 43 countries, including Pakistan, India, and Sri Lanka. Glomm and Ravikumar (1997) conducted a study to analyze the impact of government expenditure on education and infrastructure. It was discovered that spending on education had a direct impact on the development of human capital, which had long-lasting effects, as shown by the overlapping generation model. D. Aschauer and Greenwood (1985) conducted a study using the pooled ordinary least square methodology. The study's findings suggest that capital expenditures have a beneficial impact on the economy. The report proposes that these expenditures should be supported by monetary policy and existing expenditures to prevent adverse impacts on the country's economic performance.

Compared to present government spending, increased investment in capital goods accelerates economic growth (Gupta, Clements, Baldacci, & Mulas-Granados, 2005). This finding was derived from a panel of 39 emerging nations. In order to study the connection between infrastructure and public spending on elementary, secondary, and tertiary education as well as economic growth, Doble (2002) utilized a computable General Equilibrium (CGE) approach and broke down the education budget. Their research shows that raising public expenditure on elementary and secondary education can help alleviate poverty in the long term. In addition, Robinson (2004) utilized a CGE model to examine the effects of developmental public spending on a variety of sub-Saharan African sectors, including healthcare, education, transportation, agriculture, communication, defense, and social security. Increasing capital investment on health has a significant influence on reducing poverty and leads to substantial economic growth, according to his research. In contrast, spending on other categories adds little economic growth. Governments can increase economic growth by reshaping the mix of public expenditure, according to Rajaram (2005). He went on to say that government investment on capital projects has consequences for alleviating poverty in emerging nations and is associated with higher long-term economic growth than current government spending.

Public spending, especially government investment on capital projects and infrastructure services, is positively correlated with economic growth, according to Semmler et al. (2007). By applying the GMM methodology to a panel of fifteen developing nations spanning 28 years, Ghosh and Gregoriou (2008) discovered that capital government spending had a negative effect on economic growth, while health and capital expenditures were also found to be negatively and statistically significant. Their model's economic growth was positively impacted by the addition of operation and maintenance as a new category of public spending. Government investment expenditures (capital expenditures) were determined to have a positive relation with growth, according to Ali, Rabbi, Hayat, and Ali (2013) who used the ARDL approach to examine the impact of government current and capital spending in Pakistan from 1972 to 2009.
Public investment in education and infrastructure was found to have a favorable effect on growth performance when O'Neil and Tienda (2010) used the GMM instrumental variable methodology to analyze a panel of emerging nations over a 40-year period. Using data from a panel of 182 nations, Wu, Tang, and Lin (2010) investigated whether or not government spending contributed to GDP growth. They found that government expenditure had a favorable effect on wealthy countries' economies, but had the opposite effect for low-income countries' growth owing to corruption and a lack of international capacity.

Sennoga and Matovu (2010) applied the Dynamic computable general equilibrium model to the Ugandan economy and concluded that public spending certainly has implications for poverty reduction and is linked to economic growth. They added that improved reallocation of the public spending towards productive public spending such as agriculture, energy, health, and education and away from the unproductive sectors such as administration and security leads to higher gross domestic production and has implications for poverty reduction. In his findings, poverty reduction is greater in rural areas than urban areas. Semmler (2007) applied the GMM methodology to the Panel of developing countries and concluded that long-term optimal growth can be achieved by changing the composition mix of government expenditures. Further, they added that infrastructure, education, and health expenditures positively impact growth performance. By breaking down OECD countries' total public spending into its productive and unproductive parts, Gemmell, Kneller, and Sanz (2011) discovered that productive expenditures promote economic growth. Using a sample of 56 nations ranging from high-income to low-income, Ormaechea and Morozumi (2013) study the effect of government spending on growth in four categories: transportation and communication, social protection, health, and defense. Recognizing the budget constraint, they discovered that increasing one expenditure component comes at the expense of the other, and they concluded that education is the only sector that significantly boosts growth. They went on to say that this phenomenon occurs only when their model's other four types of public spending are reduced to fund increases in education spending.

Bojanic (2013) analyzed the panel of developing countries from 1940-2000. They concluded that defence, education, and infrastructure expenditures have more power to represent the economy and that the long-term equilibrium can be achieved by changing the mix of the public spending composition. Ismail (2014) strongly interpreted that the reallocation of total public spending towards education and infrastructure would be positive in attaining long-term income levels by analyzing the OECD countries from 1970 to 2010. They added that increasing the share of social welfare spending may be associated with the modest low per capita growth. Susantha (2014) applied the ordinary least square technique on time series data from 1960 to 2013, and their study confirms that government consumption of education along with the government investment in education together with spending by the government on health, transportation, and communication and agriculture have a positive impact on the economic growth. Moreover, public spending on defence negatively correlates with economic growth. Capital expenditures have a larger impact on growth than current expenditures, according to Sasmal and Sasmal (2016), who also found that growth is essential for developing nations' economies to reduce poverty. Researchers looked at data from a group of emerging nations between 1980 and 2010. By adapting Kocherlakota and Yi (1997) model with some adjustments made by Colombier and Masclet (2008) Hussain, Khan, and Rafiq (2017) examined the long-term and short-term dynamics of the composition of public spending and economic growth in Pakistan. Spending on public development, according to the findings, promotes growth, whereas spending on operating costs slows it down. Kousar, Ahmed, Afzal, and Segovia (2023) also used the auto-regressive distributed lag model (ARDL) to examine the effect of government spending on healthcare, education, and FDI in Pakistan, using yearly data from 1990 to 2020. This study confirms what many have suspected: domestic spending on health and education as well as social protection programs considerably decreased child mortality in Pakistan, and current government expenditures on health and social protection programs have a positive and significant influence on human capital in terms of primary, secondary, and tertiary education attainment as well as life expectancy at birth.

In Pakistan, a notable dearth of studies analyzes the impact of public expenditure composition on economic growth and poverty reduction. Existing studies primarily concentrate on the effects of specific public spending categories, linking them to public welfare and human capital development. A review of the empirical literature reveals that while numerous studies have explored this topic, they predominantly focus on panels of developed, developing, emerging, and advanced economies. There is a notable gap in research at the disaggregated level for Pakistan, highlighting the need for comprehensive studies that address the country's unique context.

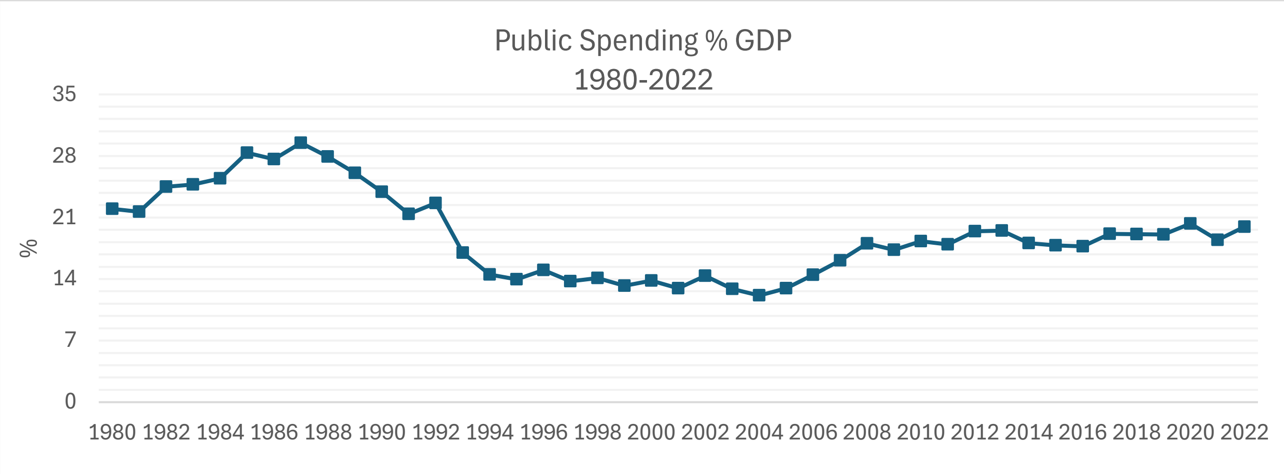
3. An Exploratory Analysis of the Public Spending in Pakistan

3.1. Public Spending Pattern in Pakistan

Pakistan lies in the South Asian region among the lower middle-income countries. It recorded a 4.92 percent GDP growth rate from 1950-2015, with an all-time high of 10.22 percent in 1954 and all time lowest of -1.80 in 1952. Another negative shock to the real GDP growth was seen in 2019, -0.9%, falling from 6% in 2018. The public spending in Pakistan mainly comprises two types of spending: capital and recurrent spending by the government, mainly financed by the revenue collected from direct and indirect taxes. Unfortunately, the taxes collected and revenue generated always remained below the expenditures incurred by the government; therefore, the government has to depend on external resources in the form of debt. Public spending in Pakistan averaged 20.84 percent of GDP from 1980-2022. At present, the government has adopted a prudent expenditure management strategy to reduce the fiscal deficit as a result in The fiscal deficit was reduced to 5.5 percent of GDP in 2013-14 as compared to the fiscal year 2012-13, which was 8.2 percent as a result the public spending was reduced from 21.5 % of GDP in 2012-13 to 20.0 % of GDP in 2013-14.

Similarly, during the fiscal year 2015, the deficit was reduced to 3.8 percent of GDP; consequently, public spending was reduced from 20 percent to 13.7 percent. After 2015, expenditures fluctuated but generally remained at around the same level. From 2015 to 2016, there is a slight decrease from 17.83 to 17.71, representing a percentage change of approximately -0.67%. 2017 there was an increase to 19.13, marking a percentage change of about +7.78% from 2016. The expenditures remain relatively stable in 2018 and 2019, with small fluctuations. 2020, there is a noticeable increase to 20.30, representing a percentage change of approximately +6.27% from 2019. In 2021, there is a decrease to 18.46, marking a percentage change of about -9.09% from 2020. Finally, in 2022, there is a slight increase to 19.95, representing a percentage change of approximately +7.98% from 2021. Overall, from 2015 to 2022, the expenditures show some variability but increase by approximately 11.88%n of GDP.

Figure 1: Public Spending % GDP from 1980-2022 Source: World Economic Outlook, 2023



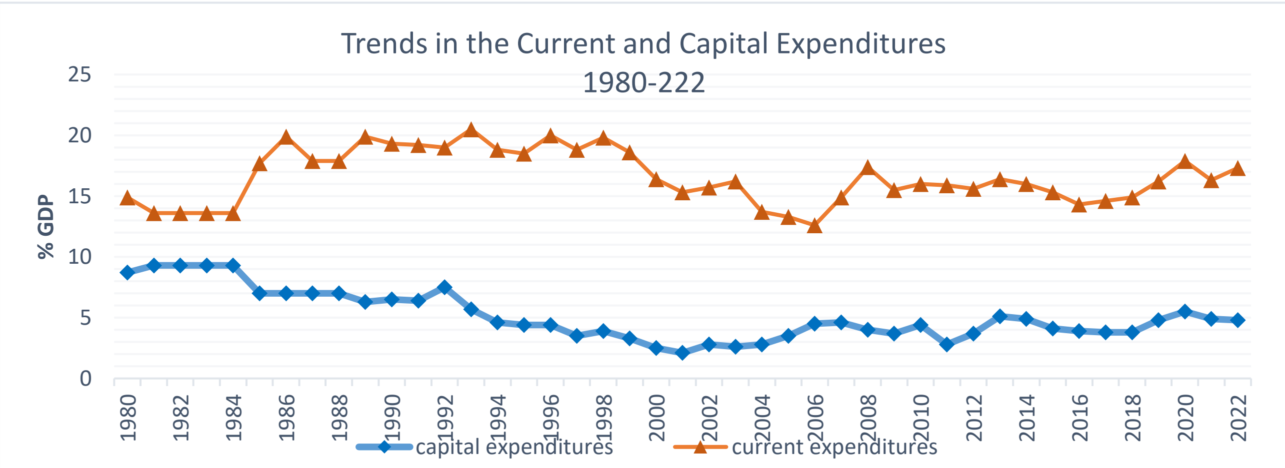
Furthermore, due to a higher debt-to-GDP ratio, lower tax-to-GDP ratio, and higher recurrent expenditures compared to capital expenditures, internal conflicts and political instability, the composition of public spending almost remained stagnant.

3.2. Composition in terms of current ancipital expenditures in Pakistan

The composition of public spending in Pakistan in terms of capital and concurrent expenditures as a percentage of GDP is summarized as follows:

The figure above shows that the recurrent expenditures have been more than the developmental ones since 1960. This could be the result of various factors, including low capital formation, low savings, lower overall growth rate, internal instability, and higher budget deficit IDP, and it could also be due to political instability and lack of policy continuation. The current expenditures are higher in Pakistan than in capital expenditures, which might be partly because of the IMF and World Bank-directed SAP (Structural Adjustment Program), which has discouraged the government from being directly involved in the economy.

Figure 2: current and Capital expenditures of Pakistan's GDP. Data from the World Development Indicators

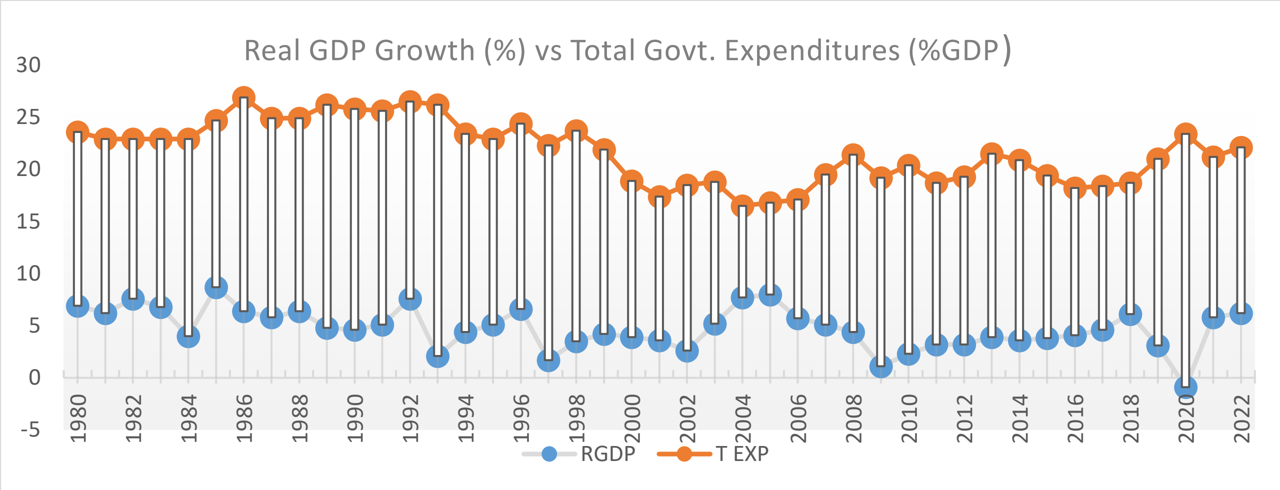


The difference between current and capital expenditures widens, especially after 1986, as shown in Figure 2. This is when Pakistan heavily relied on the IMF and World Bank. During this period, there were 11 government changes, and they made 11 different agreements with the IMF even though higher loans would affect investment, inflation, government consumption, and international openness (Barro, 1991).

3.3. Public Expenditures and GDP growth

The government expenditures were 19.84% on average from 1960 to 2014 in Pakistan, while real GDP grew 5.19% annually.

Figure 3: relationship between the Real GDP Growth Annual percentage and Govt. Total Expenditures



The government expenditures show stagnation from 1960 to 1970. After this, a rapid increase is evident after 1972. Government expenditures as a percentage of GDP have an overall upward trend, while the real GDP growth rate has a downward trend, as seen in Figure 3. If we analyze, it will depict that at the time of independence, two salient features of our economy were the non-existence of the industrial sector and trade controlled by non-Muslims. The second majority of the population was directly or indirectly attached to agriculture. Therefore, during the 1950s, industry and trade were considered the key to development. Further, let us analyze the country's economic history. It shows that during the 1950s, there was no clear-cut strategy for the economic development of the Colombo Plan, and the first five-year plan was nothing but the development in the papers; unstable governments, corrupt administration and vested interests of the capitalistic class deprived the government of revenues. There was a heavy reliance on foreign aid and assistance, and the social sector was ignored entirely. Therefore, an unstable political scenario culminated in the rule by General Ayyub Khan in 1958. In 1949-50, the GDP growth rate was 3.9%, while in 1959-60, it was just 0.9%. There were no worker's emittances during both times, and the CPI inflation was at 4.9% based in 1975-76 the share of the agricultural sector was reduced to 45.8% while it was 53.2% in 1949. During the 1960's the GDP growth rate was 9.8% and the growth rate of the GNP was 9.9%, and the share of manufacturing to GDP was 16% the real GDP growth rate was 7.24%, and the government spending was 11.92% of GDP. In the 1970s, the GDP growth rate was 7.4%, the GNP grew by 7.1%, the real GDP growth rate was 4.72%, and the government spending as a percentage of GDP was 22.12 percent on average. The share of GDP devoted to education was 1.7%, and on health, the share was 0.55% on average, which was 0.44% of GDP in the '60s. The GDP growth rate was 6.4% in 1980-81 and 5.6% in 1981-82; on average, the GDP growth rate remained at 6.3% from 1981-86. From 1986 to 88, the GDP growth rate was 7.4%, and special attention was given to the social sector in this era. In 1988-89, the growth rate was 5.1% this decline was due to the ethnic conflicts prevailing in the country, the uncertain political situation, and unexpected floods during September, which badly affected the economy of Punjab and Sindh. The manufacturing sector was severely affected by floods, and the share of manufacturing to GDP reduced to 1.2%, which was 8.1% in 1987. In 1989-90, the GDP growth rate was 5.2%, and this was the era in which various structural adjustment programs were introduced with the help of the World Bank and IMF. The GNP growth rate was 5% and 4.3% last year.

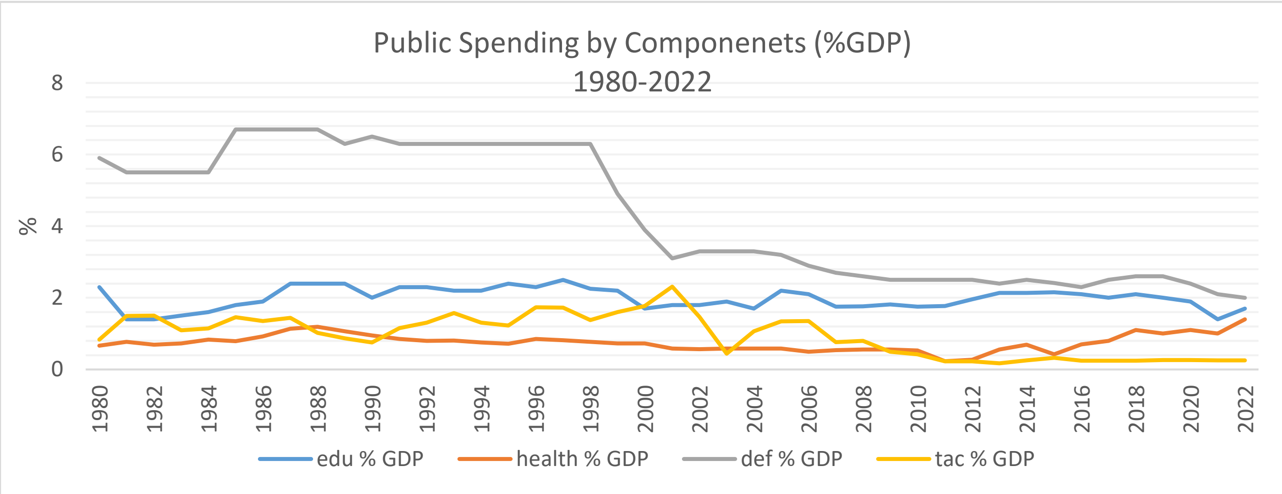
Based on the 1980-1981 prices, the GDP growth rate was 5.4% in 1990-1991 while it was 4.1% in 1989 this was due to the 5.1% growth rate in agriculture and also various measures taken by the government to increase productivity and to increase the per capita income in the country. The nationalized banks were privatized, and various measures were taken to encourage private investors to promote the industries. Various schemes were launched, and the trade deficit was reduced by encouraging exports. In 1992-93, the economy had to bear a lot due to floods; therefore, the growth rate fell to 3% during 1993-94, and the

GDP growth rate was 4% despite the fall in wheat production. During 1993-94, the industrial investment in the country increased by 15.08%, and the public sector increased by 3.23%. In 1996-1997, there was political instability in the country; therefore, the GDP growth rate again deteriorated and reduced to 3.1%, the growth rate in manufacturing was negative, and the growth rate in the agricultural sector was 0.7%. During 1997-99, the GDP growth rate was 3%, while in 2000 and 2001, the GDP growth rate was 3% and 2.6%, respectively.2004, the growth rate was 6.4% due to adopting the economic development reforms, and it was 8.5% in 2005 that happened fifth time in the economic history of the country. In 2008-09, the GDP growth rate was 4.5% while it was 2.58%, and from 2010-2015, the government kept the GDP growth rate at 5%. After 2015, the RGDP growth rate was 4.1% in 2016, 4.6% in 2017, 6.1% in 2018, 3.1% in 2019, -0.9% in 2020, 5.8% in 2021, and 6.2% in 2022. The negative number in 2020 (-0.9%) can be attributed to fiscal mismanagement and political instability, which led to disruptions in supply chains, reduced consumer spending, and a general economic slowdown. These factors combined to cause a contraction in economic activity, resulting in a negative RGDP growth rate.

3.4. Some Composition of Public Spending by Components in Pakistan

The public expenditures on defence gradually decreased from 10.89 % of GDP in 1965, a time high in the economic history of Pakistan due to the 1965 war, to 2.4 % of GDP in 2015. The public spending on defence remains, on average, 5.39 % of GDP annually from 1960-2015. The situation of social sectors like education, health, transportation, and communication is not very satisfying as it can be seen that health expenditures do not go beyond the 2% GDP in the economic history of Pakistan, and the government has spent 0.62% of GDP on average from 1960-2015. Similar is the case with education spending, which has remained at 2 % of GDP since the last decade, with a high proportion being spent on recurrent expenditures. According to the Global monitoring report published by UNESCO's EFA 2021, the public sector expenditure on education in other countries of the region was 4.9% of GDP in Bhutan, 3.2% of GDP in India, 4.7% of GDP in Iran, and 8.0 %GDP in the Maldives.

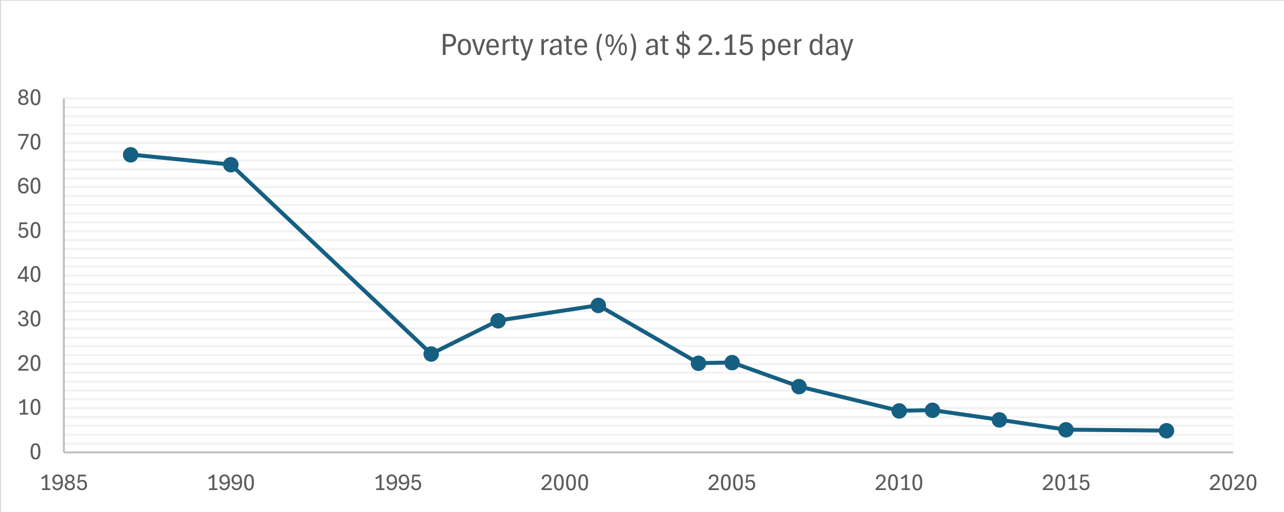
Figure 4: Components of the Government Expenditures and their trends over time



Public sector expenditures in health facilities are progressive, with the highest proportion of recurrent spending on primary health care recently, the government has been spending 0.42% of GDP on healthcare services. The spending on transportation and communication was were1.18 % of GDP on average from 1960-2015, with the highest proportion of 6.07 spent in 1995 and 6.11 % of GDP in 2006, from 1995-2006, there was an increasing trend in the spending on transportation and communication beyond which the average spending was 1.18% of GDP currently the government spent 0.25% of GDP in 2015. After 2015, there were some changes in how Pakistan allocated its resources. Spending on education decreased slightly, from 2.154% to 1.7% of GDP in 2022. Health spending stayed relatively stable, from 0.42% to 1.4% of GDP. Defence spending also remained steady, fluctuating between 2.3% and 2.6% of GDP. Total tax revenue as a percentage of GDP varied, ranging from 0.171% to 0.325%. These changes reflect shifts in government priorities and economic conditions during this period.

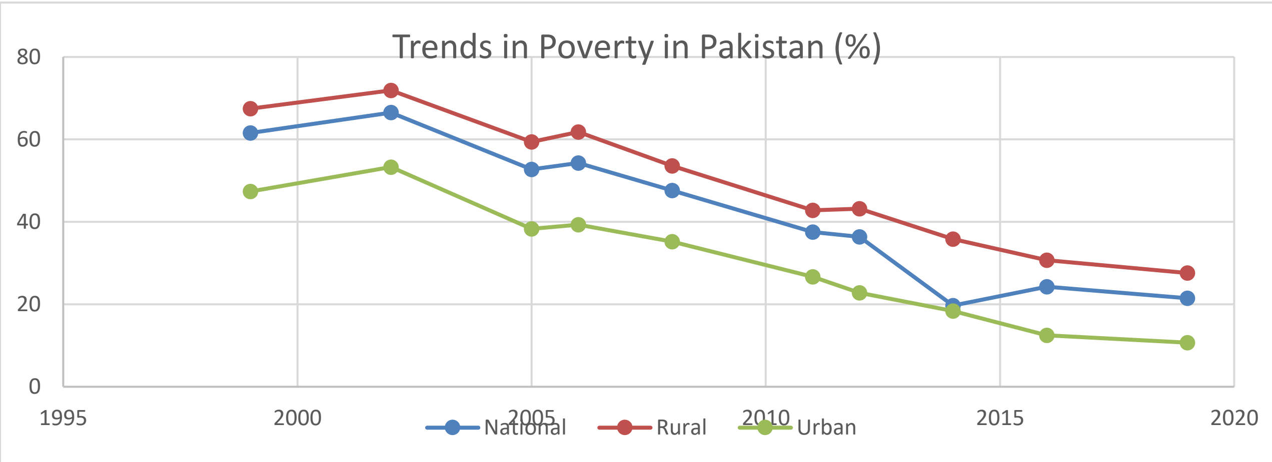
3.5. Poverty Profile of Pakistan

Figure 6: Source Asian Development Bank



The World Bank's poverty headcount Analysis 2014 has represented that if we consider the income per adult person in Pakistan at US $ 1.25/ day, the poverty level in Pakistan is 21.04 to 2008 population estimates. However, if we increase the poverty line to $ 2/day, then the poverty level in Pakistan is 60.19. The position of Pakistan is better than that of Bangladesh, India, and Nepal, while the situation of China and Sri Lanka is better than that of Pakistan.

Figure 7: Source: HIES- 1999-2018, PIDE, Planning Commission of Pakistan 2021



4. Theoretical Model

Researchers have been looking for a correlation between fiscal policy and economic growth rates since at least the 1960s, according to the literature that is currently available. Arrow and Kurz (1970) made a crucial contribution when they said that consumers get utility from both public capital and their own private consumption. In their respective models, they have both implicitly presumed that public investment yields positive results. In addition, they used a neoclassical model, which holds that government expenditure has no effect on the economy's steady-state growth rate but does on its conventional growth rate. Based on the endogenous growth theory, numerous models have been developed recently that connect government spending to the long-term growth rate of the economy. In its most basic version Barro (1990) model portrays government expenditure as a counterbalance to private sector output. Like Arrow and Kurz (1970); Barro (1990) assumes in his model that all government spending is productive. At the same time, there is a split in the empirical research about the makeup of public expenditure between that which is considered developmental and that which is not (D. Aschauer & Greenwood, 1985; Barro, 1991; Landau, 1983). The main finding of these academics is that government expenditure has a negative relationship with GDP growth.

Public investment leads to increased output, according to both Ascheur and Barrow. In keeping with the work of Devarajan, Swaroop, and Zou (1996), we can now model the relationship between private capital, government capital expenditures (both current and future), and economic growth. We can also see how changes to the composition of these expenditures affect the rate of long-term economic growth. Two forms of public expenditure (g1 and g2), along with private investment (k), are presumptively subject to a constant elasticity of substitution. with the help of these variables, we can derive a production function, which is represented by

$$y = f(k, g_1, g_2) = \left[ak^{-\varsigma} + \beta_i g_1{}^{-\varsigma} + \beta_j g_2{}^{-\varsigma}\right]^{-\frac{1}{\varsigma}}$$

Where a > 0 and $\beta i \geq 0, \beta_j \geq 0$ $a + \beta_i + \beta_j = 1$, $\varsigma \geq -1$
The government budget constraint is given by $ty = g_1 + g_2$

Where "t" is the income tax rate and is assumed to be constant over time. Now, the shares of the public expenditures going towards productive and unproductive expenditures are

$g_1 = t\varphi y$ *and* $g_2 = (1 - \varphi)ty$ Where $0 \leq \varphi \geq 1$

According to Devarjan, the government chooses consumption, c, and capital, k, to maximize its welfare. The welfare is measured by the utility function, given by the

$U = \int_0^{\alpha} u(c)e^{-\rho t}dt$ And $u(c) = \frac{c^{1-\sigma}-1}{1-\sigma}$

The budget constraint of the function is given by

$$k = (1 - t)y - c$$

Devarjan et al. (1996), derived the expression for the ratio of total expenditures and private capital as g/k

$$\frac{g}{k} = \left[\frac{t^{\varsigma} - \beta i\varphi^{-\varsigma} - \beta j(1-\varphi)^{-\varsigma}}{a}\right]\frac{1}{\varsigma}$$

For the economy, the endogenous growth rate

$$\lambda = \frac{a(1-t)\{at^{\varsigma}/[t^{\varsigma} - \beta i\varphi^{-\varsigma} - \beta j(1-\varphi)^{-\varsigma}]\}\frac{1+\varsigma}{\varsigma} - \rho}{\sigma}$$

The relationship between endogenous growth rate λ and the share of government expenditures productive expenditures, i.e., g1, is given by the relation.

$$\frac{d\lambda}{d\phi} = \frac{a(1-t)(1-\varsigma)[at^{\varsigma}]^{-\frac{1+\varsigma}{\varsigma}}[\beta i\phi^{-(1+\varsigma)} - \beta j(1-\phi)^{-(1+\varsigma)}}{\sigma[t^{\varsigma} - \beta i\phi^{-\varsigma} - \beta j(1-\phi)^{-\varsigma}]^{-\frac{1}{\varsigma}}}$$

The productive expenditure is the one whose share in the total increases the value of the λ from the equation above; thus, it is stated that the equation is productive only if *dλ/dφ > 0.* As we know, for growth to occur, it is necessary to consider the initial share of each public appending component in the budget and the absolute productivity of each component. Therefore, in such a situation, the growth model proposed by Devarajan, Swaroop, and Zou (1996) collapsed. Let us assume that the pattern of expenditures that a government follows contains N types of government expenditures with the productivity of each component represented by β*i* in the production function and if the initial share of each component is φi in the budget. Now, if the government decides to increase the share of this component to increase the economy's growth rate, it depends on which component share has been reduced in the budget. If the increase in the ith component share comes from the reduction in the jth component share, then the problem can be summarized as $\frac{\beta i}{\varphi_i} > \frac{\beta_j}{\varphi_j}$ that is, this shift in the composition of expenditures will boost the economy. Shifting from the jth component to the ith component would lower the growth if the inequality were reversed. In the presence of a specific limitation, i.e., it is assumed that government decisions are exogenous and that all government expenditures are assumed to affect economic growth.

5. Modeling framework and Data

This study intends to apply the auto-regressive distributed lag model to capture the impact of government spending composition on economic growth and poverty reduction. The data was obtained from economic surveys of Pakistan and various issues in Pakistan's economy. All the variables have been taken as a percentage of GDP except the shock variable and black-market premium, which have been generated as given above. To examine the growth impact of the current and capital components of public spending, the expenditures have been converted into current and capital expenditures, and the expenditures on education and health have also been converted into three subcategories each. Therefore, the study has calculated the following six models of government spending composition to measure the long-run impacts on economic growth and poverty.

1. Economic growth is measured by the mix of total expenditures, such as expenditure on education, health, and defence, as well as expenditure on transportation and communication, expenditure on black market premiums, and shock variables. Then, the model governing such a composition and relating to economic growth can be expressed as follows.

   Y = f (T.Exp edu health def TAC pbm shock)

   Mathematically, the model can be formulated as follows.

$$ln\, y_t = \alpha_o + \alpha_1\, ln\, t\, exp + \alpha_2\, ln\, e\, du + \alpha_3\, ln\, h + \alpha_4\, ln\, d\, ef + \alpha_5\, ln\, t\, ac$$
$$+\alpha_6 pbm + \alpha_7 shock + u_t$$

2. In model two, the expenditures on health have been divided into three sub-categories that are expenditures on public health, expenditures on patient services, and other expenditures on health along with these sub-categories defence, expenditures on education, transportation and communication, black market premium, and per capita spending on health and shock variable have been included to determine their impact. i.e.

   Y = f (def, edu, TAC, hs, ph, other, cap, black, shock)

$$ln\, y_t = \alpha_o + \alpha_1\, ln\, d\, ef + \alpha_2\, ln\, e\, du + \alpha_3\, ln\, t\, ac + \alpha_4 l\, ln\, h\, s + \alpha_5\, ln\, p\, h + \alpha_6\, ln\, o\, ther$$
$$+\alpha_7\, ln\, c\, ap + \alpha_8\, ln\, b\, lack + \alpha_9\, ln\, s\, hock + u_t$$

3. The next model consists of the sub-categories of expenditures on education, and the remaining per capita expenditure on education is the same as the above model.

   Y = f (def, expenditure on school, university, other expenditure on education, def, TAC, cap, black, shock)

$$ln\, y_t = \alpha_o + \alpha_1 \rightleftarrows ln\, d\, ef + \alpha_2\, ln\, h\, ealth + \alpha_3\, ln\, t\, ac + \alpha_4 l\, ln\, s + \alpha_5\, ln\, u + \alpha_6\, ln\, o$$
$$+\alpha_7\, ln\, e\, cap + \alpha_8\, ln\, b\, lack + \alpha_9\, ln\, s\, hock + ui$$

4. Model four consists of the government's current and capital expenditures: subcategories of education and health expenditures, defence and transportation and communication, black market premium, and shock variable.

$$ln\, y_t = \alpha_o + \alpha_1\, ln\, d\, ef + \alpha_2\, ln\, t\, ac + \alpha_3\, ln\, c\, u\, exp + \alpha_4 l\, ln\, c\, ap + \alpha_5\, ln\, s + \alpha_6\, ln\, u$$
$$+\alpha_7\, ln\, o + \alpha_8\, ln\, h\, s + a_9\, ln\, p\, h + \alpha_{10}\, ln\, o\, ther + a_{11}\, ln\, b\, lack + a_{12}\, ln\, s\, hock + u_t$$

5. In models five and six, the growth effect of the government's current and capital expenditures was determined alone.

Y = f (total expenditures, recurrent expenditures, black market premium, shock)

$$ln\, y_t = \alpha_o + \alpha_1 \rightleftarrows ln\, t\, exp + \alpha_2\, ln\, c\, ur\, exp + a_3\, ln\, b\, lack + ln\, s\, hock + u_t$$

Y = f (total expenditures, capital expenditures, black market premium, shock)

$$ln\, y_t = \alpha_o + \alpha_1 \rightleftarrows ln\, t\, exp + \alpha_2\, ln\, c\, ap\, exp + a_3 black + a_4 shock + u_t$$

"Y" in all the equations represents the growth rate of the economy, the variables have been converted into a natural logarithmic form to determine the output in percentage.

5.1. Data & Description

This study has used the time series data collected annually for the selected variables from 1980-2022. All the series were produced from Pakistan economic surveys from 1980-2012, and various issues in the Pakistan economy were covered in a handbook of statistics on the Pakistan economy. The variables of interest include

I. $\ln y_t$; which represents the GDP growth rate in the country (a proxy of economic growth) the data is constant in 2005 US dollars.

II. BMP_t; premium in the black market for foreign exchange in a country at time t, calculated as BMP = $[(bMER_t - 0ER_t)/ 0ER_t]*100$, where bMER is the black market exchange rate and the official exchange rate OER. The model's prediction regarding this variable is pessimistic, as the more the black market for credit in the economy, the worse and more susceptible the situation would be in the economy.

III. $Shock_t$; $Shock_t$ is the shock variable, which is calculated as

$$shock_t = (R_{t+1,t+5} - R_{t-4,t}) * (Debt/GDP) - (PX_{t+1,t+5} - PX_{t-4,t}) * (X/GDP) + (PM_{t+1,t+5} - PM_{t-4,t}) * (M/GDP)$$

Where PX and PM represent the export and import price indices, respectively. $(Debt/GDP)$ is the total sum of debt in percentages from GDP, and (X/GDP) is the exports as %GDP, where (M/GDP) is the total imports in percentage from the GDP. The shock variable thus represents the average changes in the import price index, export price index, and the changes in the world real interest rate weighted by the debt to GDP ratio, Exports to GDP ratio, and Imports to GDP ratio, and changes represent the change of these variables from $t - 4\ to\ t, and\ t + 1, to, t + 5$.

IV. The variable shock is expected to behave negatively in the estimation process because this represents the overall deterioration situation in the economy; the more shocks there are in the economy, the more vulnerable the economy will be. Furthermore, Devarjan et al. (1991) and Sagota Gosh and Andrew Gregarious (2008) generated the shock variable in the same way as capturing the internal fluctuations in the economy and found a negative relationship with the growth in the economy.

V. (T.E/GDP); represents the share of total expenditures by the government in GDP. This variable is assumed to harm the economic performance of the country. The economic classification of expenditures comprises current and capital expenditures. Capital expenditures are assumed to add more to economic growth than current expenditures. In the case of Pakistan, there are significant current expenditures compared to capital expenditures, which are said to be unproductive. So, the negative sign is assumed (D. Aschauer & Greenwood, 1985; Grier & Tullock, 1989).

VI. (cur/GDP); current government spending % of GDP. Represents the government's current expenditures as a percentage of GDP. The expected sign to this variable is negative as, according to the theory, the current expenditure is said to add less to the economic growth of the country (Ascheur and Greenwood. 1987. (Ali et al., 2013; Grier & Tullock, 1989).

VII. (Cap/GDP); Capital expenditures to GDP. Research by D. A. Aschauer (1989); Barro (1990); Easterly (1989); Easterly and Rebelo (1993); Gupta et al. (2005); Turnovsky (2004) suggests that government capital expenditures as a percentage of GDP contribute significantly to economic growth.

VIII. (def/GDP); Percentage of GDP allocated to defense spending. The anticipated polarity of this variable is negative, given its current nature as an expenditure and its unproductive nature, which has a detrimental impact. Nevertheless, the current research exhibits conflicting views on this factor. For instance, Grier and Tullock (1989); Kormendi and Meguire (1985); Summers and Heston (1988) categorize them as unproductive and assert that they have a detrimental effect on economic growth. Barro (1991) views defense as a means of safeguarding property rights, hence enhancing the likelihood that investors would obtain the marginal output of capital. In his model, defense is regarded as productive.

IX. (health/GDP); health expenditure as a percentage of GDP refers to the total government expenditures on the health sector, including both current and capital expenditures the expected sign of the health variable is positive in the sense that the health expenditure boosts the human capital, (Barro, 1990).

X. (edu/GDP); education expenditure as a percentage of GDP. It indicates the current and capital spending by the government on the education sector. The expected sign is positive as it is considered to be the investment in humans and hence productive (Barro 1991), but there is a controversy on this variable again like Grier and Tullock (1989); Kormendi and Meguire (1985) describe them as the current expenditures and modelled them as the unproductive. Thus, the estimation results will clear the picture of following Barrow or following others

XI. (tac/GDP); Expenditure on transportation and communication, which is used as a substitute for spending on physical infrastructure, is expected to have a positive effect on growth. This is because it is assumed to create an environment conducive to growth, particularly through investments in essential infrastructure such as streets, roads, highways, airports, mass transit, and other public facilities (D. Aschauer & Greenwood, 1985; Easterly & Rebelo, 1993).

The expenditures on health and education have been disaggregated into sub-categories, which are as

XII. The expenditure on health encompasses the sub-categories of health expenditure on hospital affairs and services (hs) and clinics that primarily provide outpatient services (ph), as well as expenditures on applied research and experimental development connected to health and medical health delivery (other).

XIII. Education expenditures are divided into three subcategories: primary and secondary [S], tertiary [U], and other [o]. Education-related services (transportation, medical, food, etc.), administration, curriculum creation, and applied research fall under this area.

XIV. To measure the level of education expenditures and health expenditures (per capita real education and per capita health expenditures have also been included in the regression.

5.2. Auto Regressive Distributed Lag model

The long-run relationship and short-run dynamics among the variables have been estimated by applying the ARDL bound technique as a general vector auto-regressive model (VAR) of order p, in Z_t, where Z_t is a vector composed of variables like Z_t = (total exp education health defence tac pbm and shock). The ARDL co-integration technique was developed by Pesaran and Shin (1995); Pesaran, Shin, and Smith (1999). It has the following three main advantages over all other traditional cointegration methods. First, the variables under study do not need the same integration level. It can be easily applied to data in which the variables are in mixed order. If they have the same or different levels of integration, the limitation is that none of the variables should be of the order of integration of two. The second advantage is that if there is a relatively small and finite data size, it can assure consistent and efficient estimates, as is the case with almost every time series. The third advantage is that as a result of ARDL, unbiased estimates of the long-run model are obtained, as indicated by (Harris & Sollis, 2003). As the study intends to apply the ARDL approach to cointegration in time series data, the equations from 1-6 can be modified into ARDL specifications for the following estimation. Δ denotes the first difference of the variables.

$$\Delta\, ln(y_t) = \alpha_{01} + \beta_{11}\, ln(y_{t-1}) + \beta_{21}\, ln(t\, exp_{t-1}) + \beta_{31}\, ln(edu_{t-1}) + \beta_{41}\, ln(h_{t-1})$$
$$+\beta_{51}\, ln(def_{t-1}) + \beta_{61}\, ln(tac_{t-1}) + \beta_{71}(pbm) + \beta_{81}(shock_{t-1})$$

$$+\sum_{i=1}^{p}\alpha_{1i}\Delta\,ln(y_{t-i})+\sum_{i=0}^{q}\alpha_{2i}\Delta\,ln(t\,exp_{t-i})+\sum_{i=0}^{q}\alpha_{3i}\Delta\,ln(edu_{t-i})$$
$$+\sum_{i=0}^{q}\alpha_{4i}\Delta\,ln(h_{t-i})+\sum_{i=0}^{q}\alpha_{5i}\Delta\,ln(def_{t-i})+\sum_{i=0}^{q}\alpha_{6i}\Delta\,ln(tac_{t-i})$$
$$+\textstyle\sum_{i=0}^{q}\alpha_{7i}\Delta\,ln\,p\,bm_{t-i})+\sum_{i=0}^{q}\alpha_{8i}\Delta\,ln\,s\,hock_{t-i})+\varepsilon_{1t} \quad (1a$$

NOW, if there is evidence of a long-term relationship (cointegration), the following long-run model is estimated

$$ln(y_t)=\alpha_{01}+\sum_{i=1}^{p}\alpha_{1i}\,ln(y_{t-i})+\sum_{i=0}^{q}\alpha_{2i}\,ln(t\,exp_{t-i})+\sum_{i=0}^{q}\alpha_{3i}\,ln(edu_{t-i})$$
$$+\textstyle\sum_{i=0}^{q}\alpha_{4i}\,ln(h_{t-i})+\sum_{i=0}^{q}\alpha_{5i}\,ln(def_{t-i})+\sum_{i=0}^{q}\alpha_{6i}\,ln(tac_{t-i})$$
$$+\textstyle\sum_{i=0}^{q}\alpha_{7i}\,ln\,p\,bm_{t-i})+\sum_{i=0}^{q}\alpha_{8i}\,ln\,s\,hock_{t-i})+\upsilon_t \quad (1b$$

The short-run dynamics can be derived by creating the following form's error correction (ECM).

$$\Delta\ln(y_t)=\alpha_{01}+\sum_{i=1}^{p}\alpha_{1i}\Delta\ln(y_{t-i})+\sum_{i=0}^{q}\alpha_{2i}\Delta\ln(t\exp_{t-i})+\sum_{i=0}^{q}\alpha_{3i}\Delta\ln(edu_{t-i}) \quad (1C$$
$$+\sum_{i=0}^{q}\alpha_{4i}\Delta\ln(h_{t-i})+\sum_{i=0}^{q}\alpha_{5i}\Delta\ln(def_{t-i})+\sum_{i=0}^{q}\alpha_{6i}\Delta\ln(tac_{t-i})$$
$$+\sum_{i=0}^{q}\alpha_{7i}\Delta\ln pbm_{t-i})+\sum_{i=0}^{q}\alpha_{8i}\Delta\ln shock_{t-i})+\psi ECM_{t-1}+u_t$$

Where ECM_{t-1} is defined to be the lagged error term calculated as

$$ECM_{t-1}=ln\,y_t-\alpha_{01}-\sum_{i=1}^{p}\alpha_{1i}\,ln(y_{t-i})-\sum_{i=0}^{q}\alpha_{2i}\,ln(t\,exp_{t-i})-\sum_{i=0}^{q}\alpha_{3i}\,ln(edu_{t-i})$$
$$+\textstyle\sum_{i=0}^{q}\alpha_{4i}\,ln(h_{t-i})-\sum_{i=0}^{q}\alpha_{5i}\,ln(def_{t-i})-\sum_{i=0}^{q}\alpha_{6i}\,ln(tac_{t-i})$$
$$+\textstyle\sum_{i=0}^{q}\alpha_{7i}\,ln\,p\,bm_{t-i})-\sum_{i=0}^{q}\alpha_{8i}\,ln\,s\,hock_{t-i}) \quad (1d$$

The ARDL modification for the model (2) can be carried out as follows:

The conditional error correction of the equation is

$$\Delta\,ln(y_t)=\alpha_{01}+\beta_{11}\,ln(y_{t-1})+\beta_{21}\,ln(t\,exp_{t-1})+\beta_{31}\,ln(edu_{t-1})+\beta_{41}\,ln(hs_{t-1})+\beta_{51}(ph_{t-1})$$
$$+\beta_{61}(other_{t-1})+\beta_{71}\,ln(def_{t-1})+\beta_{81}\,ln(tac_{t-1})+\beta_{91}(pbm)+\beta_{101}(shock_{t-1})$$
$$+\sum_{i=1}^{p}\alpha_{1i}\Delta\,ln(y_{t-i})+\sum_{i=0}^{q}\alpha_{2i}\Delta\,ln(t\,exp_{t-i})+\sum_{i=0}^{q}\alpha_{3i}\Delta\,ln(edu_{t-i})+\sum_{i=0}^{q}\alpha_{4i}\Delta\,ln(ph_{t-i})$$
$$+\sum_{i=0}^{q}\alpha_{5i}\Delta(hs_{t-i})+\sum_{i=0}^{q}\alpha_{6i}\Delta(other_{t-i})+\sum_{i=0}^{q}\alpha_{7i}\Delta\,ln(def_{t-i})+\sum_{i=0}^{q}\alpha_{8i}\Delta\,ln(tac_{t-i})$$
$$+\textstyle\sum_{i=0}^{q}\alpha_{9i}\Delta\,ln\,p\,bm_{t-i})+\sum_{i=0}^{q}\alpha_{10i}\Delta(ln\,s\,hock_{t-i})+\varepsilon_{1t} \quad (2a$$

If the variables pass the cointegration test, the following long-run model will be estimated.

$$ln(y_t)=\alpha_{01}++\sum_{i=1}^{p}\alpha_{1i}\,ln(y_{t-i})+\sum_{i=0}^{q}\alpha_{2i}\,ln(t\,exp_{t-i})+\sum_{i=0}^{q}\alpha_{3i}\,ln(edu_{t-i})$$
$$+\sum_{i=0}^{q}\alpha_{4i}\,ln(ph_{t-i})+\sum_{i=0}^{q}\alpha_{5i}(hs_{t-i})+\sum_{i=0}^{q}\alpha_{6i}(other_{t-i})+\sum_{i=0}^{q}\alpha_{7i}\,ln(def_{t-i})$$
$$+\textstyle\sum_{i=0}^{q}\alpha_{8i}\,ln(tac_{t-i})+\sum_{i=0}^{q}\alpha_{9i}(npbm_{t-i})+\sum_{i=0}^{q}\alpha_{10i}(ln\,s\,hock_{t-i})+u_t \quad (2b$$

The short-run dynamics of the ARDL model can be obtained by creating an error correction model (ECM) of the following form:

$$\Delta\, ln(y_t) = \alpha_{01} + + \sum_{i=1}^{p} \alpha_{1i} \Delta\, ln(y_{t-i}) + \sum_{i=0}^{q} \alpha_{2i} \Delta\, ln(t\, exp_{t-i}) + \sum_{i=0}^{q} \alpha_{3i} \Delta\, ln(edu_{t-i}) + \sum_{i=0}^{q} \alpha_{4i} \Delta\, ln(ph_{t-i}) + \sum_{i=0}^{q} \alpha_{5i} \Delta(hs_{t-i}) + \sum_{i=0}^{q} \alpha_{6i} \Delta(other_{t-i}) + \sum_{i=0}^{q} \alpha_{7i} \Delta\, ln(def_{t-i}) + \sum_{i=0}^{q} \alpha_{8i} \Delta\, ln(tac_{t-i}) + \sum_{i=0}^{q} \alpha_{9i} \Delta(npbm_{t-i}) + \sum_{i=0}^{q} \alpha_{10i} \Delta(ln\, s\, hock_{t-i}) + \vartheta ECM_{t-1} + \nu_t \quad (2c$$

Where ECM is given by

$$ECM_t = ln\, y_t - \alpha_{01} - \sum_{i=1}^{p} \alpha_{1i}\, ln(y_{t-i}) - \sum_{i=0}^{q} \alpha_{2i}\, ln(t\, exp_{t-i}) - \sum_{i=0}^{q} \alpha_{3i}\, ln(edu_{t-i}) - \sum_{i=0}^{q} \alpha_{4i}\, ln(ph_{t-i}) - \sum_{i=0}^{q} \alpha_{5i}(hs_{t-i}) - \sum_{i=0}^{q} \alpha_{6i}(other_{t-i}) - \sum_{i=0}^{q} \alpha_{7i}\, ln(def_{t-i}) - \sum_{i=0}^{q} \alpha_{8i}\, ln(tac_{t-i}) - \sum_{i=0}^{q} \alpha_{9i}(npbm_{t-i}) - \sum_{i=0}^{q} \alpha_{10i}(ln\, s\, hock_{t-i}) \quad (2d$$

Similarly, the model (3) can be converted into ARDL as follows

$$\Delta\, ln(y_t) = \alpha_{01} + \beta_{11}\, ln(y_{t-1}) + \beta_{21}\, ln(t\, exp_{t-1}) + \beta_{31}\, ln(h_{t-1}) + \beta_{41}\, ln(s_{t-1}) + \beta_{51}(u_{t-1}) + \beta_{61}(o_{t-1}) + \beta_{71}\, ln(def_{t-1}) + \beta_{81}\, ln(tac_{t-1}) + \beta_{91}(pbm) + \beta_{101}(shock_{t-1}) + \sum_{i=1}^{p} \alpha_{1i} \Delta\, ln(y_{t-i}) + \sum_{i=0}^{q} \alpha_{2i} \Delta\, ln(t\, exp_{t-i}) + \sum_{i=0}^{q} \alpha_{3i} \Delta\, ln(edu_{t-i}) + \sum_{i=0}^{q} \alpha_{4i} \Delta\, ln(s_{t-i}) + \sum_{i=0}^{q} \alpha_{5i} \Delta(u_{t-i}) + \sum_{i=0}^{q} \alpha_{6i} \Delta(o_{t-i}) + \sum_{i=0}^{q} \alpha_{7i} \Delta\, ln(def_{t-i}) + \sum_{i=0}^{q} \alpha_{8i} \Delta\, ln(tac_{t-i}) + \sum_{i=0}^{q} \alpha_{9i} \Delta\, ln\, p\, bm_{t-i}) + \sum_{i=0}^{q} \alpha_{10i} \Delta(ln\, s\, hock_{t-i}) + \varepsilon_{1t} \quad (3a$$

If there is co-integration, then the following long-run equation is estimated.

$$ln(y_t) = \alpha_{01} + + \sum_{i=1}^{p} \alpha_{1i}\, ln(y_{t-i}) + \sum_{i=0}^{q} \alpha_{2i}\, ln(t\, exp_{t-i}) + \sum_{i=0}^{q} \alpha_{3i}\, ln(h_{t-i}) + \sum_{i=0}^{q} \alpha_{4i}\, ln(s_{t-i}) + \sum_{i=0}^{q} \alpha_{5i}(u_{t-i}) + \sum_{i=0}^{q} \alpha_{6i}(o_{t-i}) + \sum_{i=0}^{q} \alpha_{7i}\, ln(def_{t-i}) + \sum_{i=0}^{q} \alpha_{8i}\, ln(tac_{t-i}) + \sum_{i=0}^{q} \alpha_{9i}(npbm_{t-i}) + \sum_{i=0}^{q} \alpha_{10i}(ln\, s\, hock_{t-i}) + u_t \quad (3b$$

The short-run equation thus becomes

$$\Delta\, ln(y_t) = \alpha_{01} + + \sum_{i=1}^{p} \alpha_{1i} \Delta\, ln(y_{t-i}) + \sum_{i=0}^{q} \alpha_{2i} \Delta\, ln(t\, exp_{t-i}) + \sum_{i=0}^{q} \alpha_{3i} \Delta\, ln(h_{t-i}) + \sum_{i=0}^{q} \alpha_{4i} \Delta\, ln(s_{t-i}) + \sum_{i=0}^{q} \alpha_{5i} \Delta(u_{t-i}) + \sum_{i=0}^{q} \alpha_{6i} \Delta(o_{t-i}) + \sum_{i=0}^{q} \alpha_{7i} \Delta\, ln(def_{t-i}) + \sum_{i=0}^{q} \alpha_{8i} \Delta\, ln(tac_{t-i}) + \sum_{i=0}^{q} \alpha_{9i} \Delta(pbm_{t-i}) + \sum_{i=0}^{q} \alpha_{10i} \Delta(ln\, s\, hock_{t-i}) + \vartheta ECM_{t-1} + \nu_t \quad (3c$$

and ECM is given by

$$ECM_t = ln\, y_t - \alpha_{01} - \sum_{i=1}^{p} \alpha_{1i}\, ln(y_{t-i}) - \sum_{i=0}^{q} \alpha_{2i}\, ln(t\, exp_{t-i}) - \sum_{i=0}^{q} \alpha_{3i}\, ln(h_{t-i}) - \sum_{i=0}^{q} \alpha_{4i}\, ln(s_{t-i}) - \sum_{i=0}^{q} \alpha_{5i}(u_{t-i}) - \sum_{i=0}^{q} \alpha_{6i}(o_{t-i}) - \sum_{i=0}^{q} \alpha_{7i}\, ln(def_{t-i}) - \sum_{i=0}^{q} \alpha_{8i}\, ln(tac_{t-i}) - \sum_{i=0}^{q} \alpha_{9i}(pbm_{t-i}) - \sum_{i=0}^{q} \alpha_{10i}(ln\, s\, hock_{t-i}) \quad (3d$$

The formulation of these models follows Devarajan, Swaroop, and Zou (1996), who introduced the various sub-categories of health and education expenditures and calculated the growth impact of the current and capital components of public spending. Ali et al. (2013) estimate the impact of current and capital expenditures on growth. The ARDL specification of the model (5) is as follows.

$$\Delta\, ln(y_t) = \alpha_{01} + \beta_{11}\, ln(y_{t-1}) + \beta_{21}\, ln(t\,exp_{t-1}) + \beta_{31}\, ln(cur_{t-1}) + \beta_{41}(pbm) + \beta_{51}(shock_{t-1}) + \sum_{i=1}^{p} \alpha_{1i}\Delta\, ln(y_{t-i}) + \sum_{i=0}^{q} \alpha_{2i}\Delta\, ln(t\,exp_{t-i}) + \sum_{i=1}^{q} \Delta\alpha_{3i}(cur_{t-i}) + \sum_{i=0}^{q} \alpha_{4i}\Delta\, ln(pbm_{t-i}) + \sum_{i=0}^{q} \alpha_{5i}\Delta\, ln(shock_{t-i}) + \varepsilon_{1t} \quad \text{(5a}$$

the long-run model is calculated as

$$ln(y_t) = \alpha_{01} + \sum_{i=1}^{p} \alpha_{1i}\, ln(y_{t-i}) + \sum_{i=0}^{q} 2i\Delta\, ln(t\,exp_{t-i}) + \sum_{i=1}^{q} 3i(cur_{t-i}) + \sum_{i=0}^{q} \alpha_{4i}\, ln(pbm_{t-i}) + \sum_{i=0}^{q} \alpha_{5i}\, ln(shock_{t-i}) + u_t \quad \text{(5b}$$

The short-run relationship is given by

$$\Delta\, ln(y_t) = \alpha_{01} + \sum_{i=1}^{p} \Delta\alpha_{1i}\, ln(y_{t-i}) + \sum_{i=0}^{q} 2i\Delta\alpha_{2i}\, ln(t\,exp_{t-i}) + \sum_{i=1}^{q} \Delta\alpha_{3i}\, ln(cur_{t-i}) + \sum_{i=0}^{q} \alpha_{4i}\, ln(pbm_{t-i}) + \sum_{i=0}^{q} \alpha_{5i}\, ln(shock_{t-i}) + \psi ECM_{t-1} \quad \text{(5c}$$

Where the ECM is given by

$$ECM = ln(y_t) - \alpha_{01} - \sum_{i=1}^{p} \alpha_{1i}\, ln(y_{t-i}) - \sum_{i=0}^{q} 2i\Delta\, ln(t\,exp_{t-i}) - \sum_{i=1}^{q} 3i(cur_{t-i}) - \sum_{i=0}^{q} \alpha_{4i}\, ln(pbm_{t-i}) - \sum_{i=0}^{q} \alpha_{5i}\, ln(shock_{t-i}) \quad \text{(5d}$$

Similarly, the model (6) is formulated as

$$\Delta\, ln(y_t) = \alpha_{01} + \beta_{11}\, ln(y_{t-1}) + \beta_{21}\, ln(t\,exp_{t-1}) + \beta_{31}\, ln(cap_{t-1}) + \beta_{41}(pbm) + \beta_{51}(shock_{t-1}) + \sum_{i=1}^{p} \alpha_{1i}\Delta\, ln(y_{t-i}) + \sum_{i=0}^{q} \alpha_{2i}\Delta\, ln(t\,exp_{t-i}) + \sum_{i=1}^{q} \Delta\alpha_{3i}(cur_{t-i}) + \sum_{i=0}^{q} \alpha_{4i}\Delta\, ln(pbm_{t-i}) + \sum_{i=0}^{q} \alpha_{5i}\Delta\, ln(shock_{t-i}) + \varepsilon_{1t} \quad \text{(6a}$$

The long-run model is given by

$$ln(y_t) = \alpha_{01} + \sum_{i=1}^{p} \alpha_{1i}\, ln(y_{t-i}) + \sum_{i=0}^{q} \alpha_{2i}\, ln(t\,exp_{t-i}) + \sum_{i=1}^{q} \alpha_{3i}(cap_{t-i}) + \sum_{i=0}^{q} \alpha_{4i}\, ln(pbm_{t-i}) + \sum_{i=0}^{q} \alpha_{5i}\, ln(shock_{t-i}) + u_t \quad \text{(6b}$$

The short-run coefficients are given by

$$\Delta\, ln(y_t) = \alpha_{01} + \sum_{i=1}^{p} \alpha_{1i}\Delta\, ln(y_{t-i}) + \sum_{i=0}^{q} \alpha_{2i}\Delta\, ln(t\,exp_{t-i}) + \sum_{i=1}^{q} \Delta\alpha_{3i}(cap_{t-i}) + \sum_{i=0}^{q} \alpha_{4i}\Delta\, ln(pbm_{t-i}) + \sum_{i=0}^{q} \alpha_{5i}\Delta\, ln(shock_{t-i}) + \psi ECM_{t-1} + \upsilon_t \quad \text{(6c}$$

Where ECM is given by

$$ECM = ln(y_t) - \alpha_{01} - \sum_{i=1}^{p} \alpha_{1i}\, ln(y_{t-i}) - \sum_{i=0}^{q} \alpha_{2i}\, ln(t\,exp_{t-i}) - \sum_{i=1}^{q} \alpha_{3i}(cap_{t-i}) - \sum_{i=0}^{q} \alpha_{4i}\, ln(pbm_{t-i}) - \sum_{i=0}^{q} \alpha_{5i}\, ln(shock_{t-i}) \quad \text{----6d}$$

5.3. Unit Root Tests

Before the testing of the ARDL bound procedure, the test for the presence of unit root problems was conducted by using the Augmented Dicky Fuller (ADF) and Perron (1990). Although estimating the unit root before applying the ARDL bound procedure is unnecessary, this will help us decide whether to continue with this technique. The strict assumption to find unbiased estimates is that the dependent variable should be I (1) and no variable is I (2) that is integrated of order two, other way round the regression will yield spurious results.

5.3.1. ADF unit root test

Dicky and Fuller, in 1979, developed a procedure to test for the presence of unit root problems in time series data. There are four different situations to which the ADF unit root test can be applied. In all four cases, the null hypothesis is that the series contains the unit root, but they differ in the sense that the drift term is included in the model or the model includes the constant term and the time trend. Let us have a model to be tested for the unit root

$$y_t = a + y_{t-1} + u_t$$

Where, $u_t \sim N(0, \sigma^2)$ and $cov[\rightleftarrows \varepsilon_t, \varepsilon_s] = 0, \forall \quad t \neq s$ (7

The Dicky-fuller test is performed in four ways in cases one and two, the drift term is not included in the model, while in case three, the drift term is included in the model. That is, in the first two cases$a = 0$, while in the last two cases, α is allowed to vary. The DF test uses the following regression with ordinary least squares.

$$y_t = a + \rho y_{t-1} + \delta t + u_t \quad (8$$

By taking $a = 0$ or by taking$\delta = 0$, there is a problem with such a regression as it might go through the problem of serial correlation. Therefore, the DF regression is carried out using the following model instead.

$$\Delta y_t = a + \beta y_{t-1} + \delta t + \lambda_1 \Delta y_{t-1} + \lambda_2 \Delta y_{t-2} + \ldots + \lambda_k \Delta y_{t-k} + \varepsilon_t \quad (9$$

Where k is the number of lags to be specified in the regression. If we do not include the constant term in the model, then $\alpha = 0$, and if the time trend is not included in the model then$\delta t = 0$, In the first case, we have a random walk without drift and model A is calculated without the constant and trend components in the regression. In the second case, we have included constant terms in the model, and the trend equals zero. In the third case, we have the model in which the drift term is included into the model that is, and we have a model now in which the α is non-zero. Finally, we have the case with or without the model's drift term and include the time trend in the model. The models can be summarized as follows

1. Random walk without Drift. ($\alpha = \delta = 0$)

Then, the model is

$$\Delta y_t = \beta y_{t-1} + \lambda_1 \Delta y_{t-1} + \lambda_2 \Delta y_{t-2} + \ldots + \lambda_k \Delta y_{t-k} + \varepsilon_t \quad (10$$

2. Random Walk without Drift. (δ =0)

$$\Delta y_t = a + \beta y_{t-1} + \lambda_1 \Delta y_{t-1} + \lambda_2 \Delta y_{t-2} + \ldots + \lambda_k \Delta y_{t-k} + \varepsilon_t \quad (11$$

3. Random walk with Drift. (δ =0)

$$\Delta y_t = a + \beta y_{t-1} + \lambda_1 \Delta y_{t-1} + \lambda_2 \Delta y_{t-2} + \ldots + \lambda_k \Delta y_{t-k} + \varepsilon_t \quad (12$$

4. Random walk with or without Drift.

$$\Delta y_t = a + \beta y_{t-1} + \delta t + \lambda_1 \Delta y_{t-1} + \lambda_2 \Delta y_{t-2} + \ldots + \lambda_k \Delta y_{t-k} + \varepsilon_t \quad (13$$

Deciding which model or case should be chosen depends on the economic theory and visual inspection of the data. The ADF test used the following formula to calculate the test statistics. Let us have the model.

$$y_t = \rho y_{t-1} + u_t, \text{ where } \quad u_t \sim N(0, \sigma^2) \quad (14$$

Then, the OLS estimate of the auto-correlation parameter ρ is given by (for n-observation time series).

$$\hat{\rho}_n = \frac{\sum_{t=1}^{n} y_{t-1} y_t}{\sum_{t=1}^{n} y_t^2}, \text{ if} |\rho| < 1, \text{ then}$$

$$\sqrt{n}(\hat{\rho}_n - \rho) \rightarrow N(0, 1 - \rho^2)$$

If ρ =1, we have a zero variance and the OLS parameter. $\hat{\rho}$ still converge to one in probability. The following ADF regression is fitted via the OLS to compute the test statistic, depending on including the constant and the time trend in the model.

$$\Delta y_t = a + \beta y_{t-1} + \delta t + \sum_{j=1}^{k} \lambda_j \Delta y_{t-j} + e_t \qquad (15$$

The test statistic for the $H_0: \beta = 0$, is given by $Z_t = \frac{\hat{\beta}}{S.E(\hat{\beta})}$

5.3.2. Philips-Perron unit root test

The Philips- Perron unit root test involves fitting the following regression.

$$y_t = \alpha + \rho y_{i-1} + u_i \qquad (16$$

Where $ui \sim N(0, \sigma^2)$

We may exclude the constant or may include the trend component in the model. There are two statistics, Z_t *and* Z_p, calculated as.

$$\hat{\rho}_n = \frac{\sum_{i=1}^{n} y_{i-1} y_i}{\sum_{i=1}^{n} {y^2}_i}$$

6. Results and Discussion

Table 1: ADF and PP unit root test on levels of the variables

	ADF-Test			PP Test	
variables	SIC	T-Statistic	Critical Value @ 5%	T-Statistic	Critical Value @ 5%
ln(GDP)	0	-1.479^{b}	-3.5444	5.7933^{c}	-1.9506
ln(T.EXP)	0	-2.1349^{b}	-3.5444	-1.4011^{c}	-2.9484
ln(Curexp)	0	-2.0527^{b}	-2.9484	-2.0312^{a}	-2.9484
ln (CapEXP)	0	-1.6461^{b}	-3.5444	-1.1879^{c}	-1.9506
ln(Edu)	2	-2.7454^{a}	-2.9484	-2.9635^{a}	-2.9484
ln(Health)	1	-0.0906^{c}	-1.9513	-0.9704^{c}	-3.5444
ln(def)	0	-2.5554^{b}	-3.5484	-1.8329^{b}	-3.5442
ln(Tac)	0	-3.1616^{b}	-3.5442	-3.1264^{a}	-3.5442
ln(Pbm)	0	-4.0663^{b**}	-2.9484	-4.0287^{c**}	-2.9484
ln(shock)	0	-2.483^{b}	-3.5442	-2.4745^{b}	-3.5442
ln(ph)	0	-2.2559^{a}	-2.9484	-2.3878^{a}	-2.9484
ln(hs)	0	-2.3584^{b}	-3.5442	-2.344^{a}	-2.9884
ln(other)	1	-3.4627^{b}	-2.9484	-2.3184^{a}	-2.9484
ln(s)	0	-2.7668	-2.9484	-2.930^{a}	-2.9484
ln(u)	0	-1.8892^{b}	-3.5444	-2.1588^{c}	-2.9506
ln(other)	0	-2.4113^{a}	-2.9484	-2.1947^{a}	-2.9484
ln(hcap)	4	-2.5389^{b}	-2.9604	-2.5349^{b}	-3.5442
ln(ecap)	0	-3.1832^{a}	-3.5442	-3.1682^{b}	-3.5442

*Where subscript "a" denotes the regression model with intercept ", b" denotes the regression with intercept and trend, and "c" indicates the model without trend and intercept.** indicates the significance of the variable at 5%.*

The results for the integration show that all the variables are non-stationary at this level except for the black market premium. The ADF and PP unit root tests have been performed at the first difference to ensure that variables are of order I (1). The detailed process of the unit root is given in the appendix. The variables have been tested individually for the presence or absence of the unit root problem, and the results have been drawn in favour of what the maximum applied test stated about the unit root problem.

Table 2: Unit root on first difference of the variables

variables	ADF-Test			PP Test	
	SIC	T-Statistic	Critical Value @ 5%	T-Statistic	Critical Value @ 5%
ln(GDP)	0	-5.6011^{b*}	-2.9511	-5.6011	-3.639^{a*}
ln(T.EXP)	0	-5.9104^{c*}	-2.6347	5.9912	-2.6347^{c*}
ln(Curexp)	0	-5.6423^{c*}	-2.9884	5.6897	-1.9510^{c*}
ln (CapEXP)	0	-5.9632^{c*}	-3.5444	-5.9643	-1.9510^{c*}
ln(Edu)	2	-8.0242^{c*}	-2.6347	-8.0818	-1.9510^{c*}
ln(Health)	1	-7.1408^{c*}	-2.6369	-5.3827	-1.9510^{c*}
ln(def)	0	-3.6805^{b*}	-2.6347	-3.6707	-1.9510^{c*}
ln(Tac)	0	-8.9126*	-1.9510	-10.9247	-1.9510^{c*}
ln(Pbm)	0	-7.4089*	-2.9484	-9.2954	-1.9510^{c*}
ln(shock)	0	-6.4871^{b*}	-1.9510	-6.6272	-1.9510^{c*}

ln(ph)	0	-6.3547[c*]	-2.9484	-7.5342	-2.9511[a*]
ln(hs)	0	-6.7687[c*]	-1.9510	-6.7564	-1.9511[c*]
ln(other)	1	-5.2492[c*]	-1.9510	-6.1208	-1.9510[c*]
ln(s)	0	-6.4848[c*]	-1.9510	-6.8079	-2.9484[a*]
ln(u)	0	-5.8393[c*]	-1.9510	-5.8391	-1.9513[c*]
ln(other)	0	-7.4295[c*]	-1.9510	-7.4229	-1.9510[c*]
ln(hcap)	4	-3.2316[b***]	-3.2183	-6.2981	1.9510[a*]
ln(ecap)	0	-8.0583[c*]	-2.9511	-7.9569	-1.9513[c*]

Where "a" represents the regression with intercept ", b" represents the regression with intercept and trend, and "c" indicates the model without trend and intercept.** indicates the significance of the variable at 5%. The estimation is obtained with trend and intercept, with constant and without trend and intercept. The trend and constant were included in the regression, and if a trend was found to have an insignificant impact, then the equation was estimated without the trend and constant. Similarly, the constant has been included in the regression. If this turns out to be insignificant, it drops, and the equation is constant and estimated without a trend. The ADF and Philips-Perron applied to the first difference of the data series rejected the null of non-stationary at the first difference and, therefore, are in favour of the argument that the variables are of order I(1), except the black-market premium, which is I(0) that is stationary at level.

6.1. Empirical Estimation and Results

6.1.1. Bound Co-integration Test.

The ARDL bound cointegration tests the cointegrated association between the variables of the models included in the study. For the error-correcting form between the variables of all the models described above, the resulting F-value from each model should be above the upper bound critical values given by Narayan (2005)[1]. The bound test is mainly based on the joint F-test, which gives the non-standard asymptotic distribution under the null hypothesis of the no-cointegration. Therefore, the null hypothesis of no cointegration among the variables is tested, which depends on the joint significance of the lagged levels of the variables. The joint hypothesis is $H_0: \beta_{11} = \beta_{12} = \beta_{13} = \beta_{14} = \beta_{15} = \beta_{16} = \beta_{17} = \beta_{18} = 0$ against the alternative $H_0: \beta_{11} \neq \beta_{12} \neq \beta_{13} \neq \beta_{14} \neq \beta_{15} \neq \beta_{16} \neq \beta_{17} \neq \beta_{18} \neq 0$ two sets of critical values are obtained from Pesaran and Shin (2001) and Narayan (2005) at a given significance level. The first set indicates that all the variables included in the model are integrated of order zero, and the second set indicates that the variables included in the model are integrated of order I (1).

Table 3: Bound Co-integration test

H0: No Error Correction		
F- Statistics	**Value**	**K**
	7.6516*	7
Critical Value	I(0)	I(1)
1%	2.98	4.28
5%	2.32	3.5
10%	2.03	3.13

' 'indicates the significance at a 1% level of significance.*

As the value of calculated bound statistics is 7.6516, more than the upper bound critical value given by Narayan, we favour the rejection of null of no cointegration and conclude that the model exhibits a long-run relationship.

Table 4: Long Run coefficients of the ARDL Model 1

	Coefficient	**Std.Error**	**t-Statistics**	**Probability**
C	0.5307	0.4612	1.1507	0.2723
ln(TEXP)	-0.1566	0.0722	-2.1691	0.0264
ln(health)	-0.5120	0.3882	-1.3189	0.2114
ln(def)	0.7548	0.3296	2.2900	0.0409
ln(edu)	0.1701	0.0575	2.9583	0.0121
ln(Tac)	-0.0863	0.0267	-3.2322	0.0073
ln(Pbm)	-0.0433	0.0100	-4.3310	0.0264
ln(shock)	0.8400			
R-Square	0.8311			
Adj R Square	0.0629			
SE.Regression	-2.4329			
AIC	-1.4805			
SIC	61.1431			

Log-Likelihood	3.2200	
F-Statistics	3.22	0.0208
D-Watson	2.038	

The long-run coefficients are based on equation 1, which represents the composition effect of government expenditures on economic growth. The critical values provided by Pesaran, Shin, and Smith (2001) are applicable exclusively to high sample sizes, specifically T = 500 and T = 40,000. Thus, in our particular situation, it belongs to us. We utilize the critical values provided by Narayan. Due to the contention made by Narayan and Narayan regarding the smaller critical values in Pesaran, Shin, and Smith (2001) study, which may lead to biased results for small sample sizes, the critical values proposed by Narayan (2005) have been utilized to determine the more suitable test for the small sample range of T=30 to T=80.

Table 5: Estimated short-run coefficients of the ARDL Model

	Coefficient	Std.Error	t-Statistics	Probability
ECM (-1)	-0.8049	0.1487	-5.4129	0.0020
Δln (T.Exp)	0.0258	0.1835	0.1406	0.8786
Δln ($T.Exp_{t-1}$)	-0.4955	0.1820	-2.7225	0.0185
Δln (Health)	-0.2080	0.0583	-3.5671	0.0039
Δln ($Health_{t-1}$)	0.2215	0.0642	3.4502	0.0048
Δln (def)	-0.1038	0.1774	-0.5851	0.5941
Δln (def_{t-1})	0.5335	0.1688	3.1603	0.0081
Δln (edu)	0.0390	0.1147	0.3400	0.7385
Δln (edu_{t-1})	-0.3118	0.0782	-3.9872	0.0081
Δln (TAC)	0.0827	0.0129	6.4109	0.0010
Δln (TAC_{t-1})	-0.0298	0.0192	-1.5521	0.0010
Δln (PBM)	-0.0691	0.0183	-3.7801	0.0025
Δln (shock)	-0.0022	0.0023	-0.9565	0.3594
Δln ($shock_{t-1}$)	-0.0065	0.0029	-2.2414	0.0483

$$Cointeq = GDP\_ln - (0.7549 * Edu\_ln - 0.5126 * Def\_ln - 0.5566 * Health\_ln - 0.0043 shock\_ln + 0.1700 * tac\_ln + 0.5308 * Texp\_ln - 0.0864 * Pbm\_ln - 0.1511$$

The estimates in equation one indicate evidence of the long-run relationship between the variables that can be seen from the significant value of the bound cointegration test. The calculated F-statistic is more than the upper bound critical value at 1 %, so the first model has an error-correcting relationship among the variables. The estimated coefficients of equation 1, which represent the expenditure share according to the functional classification of government expenditures, indicate that the expenditures on education, transportation, and communication positively and significantly affect the economic growth of Pakistan in the long run. In contrast, the expenditures on health and defence have a statistically significant and negative correlation with the country's economic performance. As we know, economic infrastructure expenditure mainly includes a high proportion of capital expenditures in developing countries. Therefore, the finding is that infrastructure expenditures on transportation and communication positively impact Pakistan's economic performance. The results are also consistent with the finding of Rebello, Getirana, Rotunno Filho, and Lakshmi (2020), who reported that the public spending on the infrastructure sector in developing countries adds more to the economic growth of developing countries with a very high proportion as compared to other components of the spending by the government. The government's influence on education in Pakistan has a beneficial and substantial effect on economic growth. This discovery is in line with the findings of Devarjan et al. (1996), as well as the findings of Ghosh and Gregoriou (2008) and Susantha (2014). This means that in the long run, government spending is productive, as, according to Barro (1990) public spending on education is spent on human capital. Thus, based on the findings, it is concluded that spending on this specific sector of thee economy has a growth effect.

This was the only expenditure category that was significant in their analysis. Grier and Tullock (1989); Kormendi and Meguire (1985); Summers and Heston (1988) classify education and defence as the government's current spending and hence unproductive. At the same time, Barro (1990) viewed them as capital spending and productivity. The above model has been estimated based on equation one, which represents the composition effect of public spending on various components like education, health, transport and communication, black market premium and shock. Also, the total government spending has been included in the model. The model has been estimated using AIC criteria with automatic lag selection. ARDL (1 1 1 1 1 1 1 0) has been estimated, and the order of variables is (GDP, education, defence, health, shock, TAC, total exp, black market premium). We used the 2 lags for dependent variables and 3 lags for independent variables dynamic repressors but also have been experimented with the other lags structures. The model's results are robust to other lag structures and are attached at this document's end. It can be noted that the model is also accessible from the serial correlation and heteroscedasticity errors, as can be seen from the values of the Breusch-pagan and Godfrey tests statistics. Also, the model is correctly specified; further, the normality of the model can be checked using the Jarque-Bera statistic. The table's findings indicate that government expenditures, when considered as a whole, do not have a significant impact on the economic performance of the country. The primary factor is that government expenditure tends to be bureaucratic and inefficient, impeding economic growth rather than promoting it. The results align with the conclusions drawn by previous researchers such as Devarajan, Swaroop, and Zou (1996); Grier and Tullock (1989); Haque (2004); Shabbir, Ahmed, and Ali (1994). Further, it can be concluded that the government mainly relies on the current expenditures, which are considered unproductive. This means that the overall public spending by the government consists of consumption expenditure instead of capital expenditures; therefore, the economy faces an insignificant impact on the side of total public spending.

This is further tested in model 5 and model 6, in which the growth impact of the current and capital components of the economic growth are analyzed along with the other variables. The defence expenditures are negative and insignificant; in the long run, this spending by the government failed to determine any growth effect. The finding is consistent with Grier and Tullock (1989); Kormendi and Meguire (1985); Summers and Heston (1988) who modelled them as the current spending by the government and unproductive. Under the short-run table, the economic growth and the total expenditure by the government have a lag structure. The total expenditures have a significant impact on economic growth in the short run in one period lag, and in two periods lag, it means the expenditures by the government also impact the economy in the short run with a negative sign. Similarly, in the short run, the expenditures on health and education also significantly affect the economy. In the short run, health expenditures have a significant and positive impact, while, unlike the long run relationship, the expenditures on education have a negative impact. However, we have an interesting situation with defence spending in the short run. The defence expenditures, in the short run, have a positive and insignificant impact on economic growth, but if we go one period lag back, the expenditures are positive and significant; similarly, for two periods lag back, the defence expenditures are again negative and significant as they behave in the long run.

This means that in the short run, defence expenditures add to the country's economic growth and are productive, but as time passes, these become unproductive in the long run if we use them in excess. This is also in line with the argument that productive expenditures become unproductive if excessive amounts are excessive (Devarajan, Swaroop, & Zou, 1996). The coefficient of transportation and communication expenditure is negative and significant in the short term but positive in the long run and significant because, mainly, the expenditures on this sector of the economy are said to be productive. It requires time to invest in this sector. In other words, the expenditures incurred in this sector are almost capital expenditures, which have a lag structure. They might behave as negative in the short run because it requires time to convert an investment into output; therefore, in the short run, they might behave as negative, but in the long run, they become positive and significant, as predicted with this model. As for the other variables in the model, the black market premium and shock variables are negative and significant. This is in line with the expectation of the model. In short, if there is more black market in the economy, there would be more distortion, negatively affecting the country's economic performance. Similarly, the shock variable is negative in all the models, representing that the shocks negatively correlate with GDP growth.

Table 6: Results of Diagnostic Tests

Tests	Statistic	Probability
B-Godfrey serial correlation test.	11.2129	0.0054
B-P Godfrey heteroscedasticity test	13.7024	0.8759
Jarque – Bera test	0.5636	0.7544
Ramsey Reset Test	0.0148	0.9079

The diagnostic tests and other stability tests showed no issue with the serial correlation in our estimated model, and it is also accessible from the problem of heteroscedasticity, as indicated in the above table. The model is also correctly specified and stable, which can be seen from the values of CUSUM and the square of CUSUM in the appendix of this chapter. The null hypothesis of the B-godfrey serial correlation is that there is no serial correlation problem in that data versus that there is a serial correlation problem. The probability of the test shows that we cannot reject the null of no-serial and, therefore, conclude that there is no serial correlation problem in the data. The same is the case with the heteroscedasticity test, where we are also unable to reject the null of the homoscedasticity. Spending on (i) hospital services [lnhs]; (ii) clinics primarily meeting out-patient services [lnph]; (iii) public health affairs and services (preventive type) and experimental development related to the medical and health delivery system and R&D make up the respective subcategories of public health spending in Table 5. We find that the health spending on hospital affairs and services has positive but insignificant growth effect, the other two categories of health spending also have negative but insignificant growth impact, also the unit increase in the per-capita health spending negatively affect the economic performance of the country. Therefore, It is concluded that neither the total health expenditures as a percentage of GDP nor the health spending per capita contribute to economic growth.

Table 7: Contribution of health (Component) of public spending to economic growth

	Long Run Coefficients			
	Coefficient	**Std.Error**	**t-Statistics**	**Probability**
C	-0.0164	0.0588	-0.2789	0.4057
ln(def)	0.2251	0.2653	0.8485	0.7830
ln(edu)	-0.0566	0.1525	-0.3711	0.5299
ln(tac)	0.0960	0.0259	3.7066	0.0403
ln(hs)	-0.0900	0.0724	-1.2434	0.1967
ln(ph)	-0.0136	0.0819	-0.1661	0.2802
ln(oth)	0.0320	0.0246	1.3008	0.5380
ln(hcap)	0.0326	0.0206	1.5825	0.5266
ln(pbm)	-0.0359	0.0782	-0.4591	0.1418
ln(shock)	-0.0010	0.0040	-0.2519	0.8030
R-sqaure	0.6170			
Adj. R Square	0.3991			
SE.Regression	0.0749			
AIC	-2.0607			
SIC	-1.4770			
Log-likelihood	48.0310			
F Statistics	2.8290			
D-Watson	2.0229	0.0178		

Model 2, as estimated by equation 2, was subjected to the bound test, which demonstrated cointegration of the variables. At a five percent significance level, the bound test's computed F-statistic of 3.32 is more than the upper limit critical value of 3.30. With a maximum of two lags, the lag structure is based on the AIC criterion. ** Display the significance at the five percent significance level. The education costs are negative with this variable order if we take into account the other model coefficients, but they are not significant in this case. Similarly, the defence expenditures are also positive but insignificant, as opposed to equation 1, which is negative and insignificant. Further, the premium in the black market and shock are both negative in model 1 and significant, meaning that the black market and shocks in the economy negatively affect economic growth. The more black markets there are in the economy, the more vulnerable the economy is. As for the health expenditures per capita, they are positive in the long run but insignificant. The expenditures on transportation and communication have again been positive for economic growth. The error correction term is -0.85, which is significant and shows that the model converges back to the equilibrium when some exogenous shock hits the equilibrium. The tests on the stability of recursive estimates and diagnostics showed that the model is free from heteroscedasticity and serial correlation. Also, the values of the Jarque Bera and Ramsey tests are insignificant, indicating that the model is stable and that the values are normally distributed.

Table 8: Short-run impacts of the health component spending on economic growth

	Short Run Coefficients			
	Coefficient	**Std.Error**	**t-Statistics**	**Probability**
ECM (-1)	-0.8512	0.1812	-4.6976	0.0020
Δln (def)	-0.0083	0.1294	-0.0641	0.8786
Δln (edu)	0.0480	0.0127	3.7795	0.0185
Δln (TAC)	0.0883	0.0559	1.5796	0.0039
Δln (hs)	0.0802	0.0669	1.1988	0.0048
Δln (ph)	-0.0127	0.0206	-0.6175	0.5941
Δln (other)	-0.0152	0.0836	-0.1818	0.0081
Δln (hcap)	-0.0631	0.0207	-3.0493	0.7385
Δln (PBM)	-0.0632	0.0053	-11.9208	0.0081
Δln (shock)	-0.0012	0.0054	-0.2222	0.0010

In a close relationship to this fact that the study examined the contributory impact of each health component on GDP growth, the short-run results indicate that public spending on health has a positive relationship with economic growth, but this is insignificant, where other components of the health spending all are negative concerning the economic growth and insignificant even the health expenditures per capita are negative and insignificant this is the same finding as has been derived from the first equation in which the total public spending on health has negative impact on the GDP growth of the country. This means that, in the short run, public spending on health has no contributory impact on the country's GDP. This may be attributed to government spending on health, which is primarily current. The government is mainly engaged in the current expenditures on the health sector, not the capital spending. This means the government is not expanding the existing structure of the health sector and is not investing in this sector so that more educated human capital can be engaged in it. Therefore, the current spending has no growth effect. The negative sign does not imply that health spending has a detrimental impact on the country's economic growth. Rather, it signifies that the government is allocating a less proportion of its expenditure to the health sector compared to other sectors of the economy. The government mostly depends on current expenditure, prioritizing segments of the economy other than the health sector. Thus, the government's spending pattern in this area will remain constant in the long term. As a result, it does not have a substantial effect on the country's GDP growth. Model 3 categorizes education expenditures into three sub-categories: (i) elementary and secondary education expenses, [lnps], (ii) tertiary education expenses, [lnu], and (iii) other education expenses, [lno].According to Model 3, none of the sub-categories of education expenditures have a substantial growth effect. However, the total government expenditures in Model 1 have a large and beneficial impact on the country's economic growth. Over time, the government's spending on higher education has a weak and unimportant correlation with the economic growth of the country. Ultimately, this aspect of schooling does not have any impact on growth.

Table 9: Contribution of the education (Components) of public spending to economic growth

	Long Run Coefficients			
	Coefficient	**Std.Error**	**t-Statistics**	**Probability**
C	0.0273	0.0308	0.8864	0.3891
ln(def)	-0.4428	0.3574	-1.2389	0.0047
ln(edu)	-0.0986	0.0703	-1.4021	0.1805
ln(tac)	0.0375	0.0155	2.4285	0.0274
ln(s)	-0.1070	0.0393	-2.7198	0.0151
ln(U)	-0.0162	0.0229	-0.7074	0.1848
ln(oth)	0.0458	0.0260	1.7624	0.0971
ln(hcap)	0.0091	0.0119	0.7647	0.4541
ln(pbm)	-0.0170	0.0128	-1.3281	0.2032
ln(shock)	-0.0156	0.0010	4.3265	0.0014
R-sqaure	0.9031			
Adj. R Square	0.7000			
SE.Regression	0.0512			
AIC	-2.8756			
SIC	-1.5687			
Log-likelihood	68.0237			
F Statistics	4.4597	0.0937		
D-Watson	2.3711			

Note: The bound Co-integration for this model showed the long-run relationship among the variables. The calculated F-statistic is 3.65 more than the upper limit bound of 3.39 at a 5% significance level. Where *,**.*** indicates the significance level at 1%, 5% and 10% respectively.

Similarly, the expenditures on primary and secondary education are negative and significant in the long as opposed to the tertiary education expenses. This category of the education component has a negative growth effect, but the expenditures on other education spending (another) affect the GDP growth of Pakistan positively, as reported in Table 8. A unit increase in the share of this category of education spending increases 0.045 percentage points of the GDP growth. The level of education spending estimated by (per capita real education expenditures) has a negative growth effect in the long run. As for the other variables in this model, the black market premium and shock variables are negative, and the health expenditures are negative but the expenditures on transportation and communication have a positive relationship with the economic growth. The study differs from the existing studies in Pakistan in that it has included the subcategories of public spending in the models. The government expenditure is divided into capital and current expenditure, and expenditures on education have been divided into three sub-categories. The expenditures on health have three sub-categories. It has also included the shock variables and black market premium in the models to determine their impact on economic growth, and the study has implied ARDL-bound estimation concerning Pakistan. The results of the serial correlation and heteroscedasticity are given in the appendix. The diagnostic showed that the model is accessible from the problem of the serial correlation and heteroscedasticity problem, and the functional form specification test also clarifies the model as valid for the misspecification. The normality test, that is, the Jarque-Bera test's insignificant value, confirms the data's normality. Co-integrating equation about model 3.

$$cointeq = ln \llbracket GDP - (-0.4428 def\_ \rrbracket ln - 0.0986 health\_Ln + 0.0375\, tac\_ln - 0.1070 S\_ln - 0.0163 U\_ln + 0.0458\, 0\_ln + 0.0091\, eCap\_ln - 0.0171\, Pbm\_ln - 0.0156\, Shock\_ln + 0.0273$$

Table 10: Short-run impacts of the education (component) spending on economic growth

Variables	Coefficients	St. Errors	T-statistic	Probability
ECM (-1)	- 0.63305	0.33013	- 1.9175	0.0841***
Δln (def)	- 0.09617	0.14704	- 0.6540	0.5279
Δln (health)	- 0.16004	0.05677	- 2.8190	0.0182**
Δln (TAC)	0.05212	0.02996	1.7393	0.1126
Δln (s)	0.13460	0.08252	1.6310	0.1339
Δln (u)	0.10282	0.04073	2.5240	0.0302**
Δln (u_{t-1})	0.14649	0.03662	3.9997	0.0025*
Δln (o)	0.03172	0.02590	- 1.2247	0.2487
Δln (o_{t-1})	- 0.08298	0.03570	2.3244	0.0424**
Δln (ecap)	0.00477	0.02375	0.2008	0.8449
Δln ($ecap_{t-1}$)	- 0.12462	0.02856	- 4.3628	0.0014*
Δln (PBM)	- 0.06049	0.01988	- 3.0424	0.0424**
Δln (PBM_{t-1})	- 0.04582	0.02431	- 1.8844	0.0889***
Δln (shock)	- 0.00112	0.00538	- 0.2138	0.8328

The error correction term is -0.63 and is significant at a 10% significance level, which validates the long run relationship among the variables included in the analysis. This means that the deviation from the long will be corrected at a speed of 63%.

Table 11: ARDL Bound Test on the Model 3

Diagnostics	Statistic	Probability
Breusch-Godfrey serial correlation test.	0.8915	0.3884
Breusch pagan Godfrey heteroscedasticity test.	13.5908	0.3276
Jarque – Bera test.	2.0272	0.3628
Ramsey Reset Test	2.6017	0.1225

The tests on the stability of recursive estimates and diagnostics showed that the model is free from heteroscedasticity and serial correlation. Also, the values of the Jarque Bera and Ramsey tests are insignificant, indicating that the model is stable and that the values are normally distributed. Equation (3). The current or capital spending? The results of Table 11 investigate the growth impact of the current and capital expenditures along with the other variables. In this section, we shall develop the link between capital and the current component of public spending. The empirical results in Table 11 show that capital expenditures have a positive and significant relationship with the country's economic growth.

Table 12: Contribution of capital (component) of public spending to the Growth rate

Long-Run Coefficients				
Variable	**Coefficient**	**Std.Error**	**statistic**	**Prob**
C	0.12879	0.06886	1.86283	0.0759***
Ln (cap)	0.35928	0.13794	2.60461	0.0162**
Ln (texp)	- 0.48014	0.25189	-1.90617	0.0698***
Ln (pbm)	- 0.02269	0.02793	0.81244	0.4252
Ln (shock)	- 0.00162	0.02067	-0.79362	0.4359
R square	0.6980			
Adjusted R^2	0.5607			
SE regression	0.0644			
AIC criterion	-2.3851			
SIC criterion	-1.8863			
F- Statistic.	5.0849			0.00071
D-Watson	1.8563			

The bound co-integration showed the long-run relationship between the variables as the calculated bound value was more than the upper limit critical bound value. (Estimates containing model 5. (F statistic is 8.36 where the upper limit bound is 5.06 at 1 % significance level). ** And *** indicate the significance at 5% and 10%, respectively.

$$Cointeq = GDP\_ln - (0.3593 * Cap\_ln - 0.4801 * Texp\_ln + 0.0227 * Pbm\_ln - 0.0016 * Shock\_ln + 0.1283).$$

The ARDL (1 2 1 2 0) has been estimated with the lag selection depending on AIC determined by the VAR selection criterion with a maximum of four lags. This is relevant to the conventional theory that states that the physical capital of the nation is increased by capital goods expenditures (roads, bridges, dams, ports, power plants, etc.). The conclusion is that the private sector and capital stock that results will eventually boost productivity in the economy and hence have a beneficial growth impact. Furthermore compatible with this result are the conclusions of the (D. A. Aschauer, 1989; Barro, 1990; Easterly & Rebelo, 1993; Gupta et al., 2005; Turnovsky, 2004). The figures in Table 11 revealed that the overall economic growth of the nation is adversely and significantly impacted by the total expenditures of the government. We are mostly interested in the long-term performance of the economy, thus in the long run, the total public spending has a negative effect, which is contrary to the results of model 1, in which this variable was insignificant in the long run but had some positive growth impact on the economy in the short run. Analyzing Pakistan, the primary cause of the negative growth effect is that bureaucracy makes up the majority of government expenditures, which are ineffective and stifle rather than promote economic growth. Furthermore, as table 13 shows, current expenditures—which are ineffective and have a detrimental growth effect—make up the majority of Pakistani government spending. In the meanwhile, shock and the black market premium have a negative effect on economic growth.

Table 13: Short-run impacts of the capital component of public spending on economic growth

Short run coefficients				
Variables	**Coefficients**	**St. Errors**	**T-statistics**	**probability**
ECM (-1)	-0.8697	0.29600	- 2.9380	0.0148**
Δln (cap)	0.0230	0.07921	0.30291	0.7648
Δln (Cap_{t-1})	-0.1559	0.07913	-1.97001	0.0615
Δln (TEXP)	- 0.2117	0.19382	-1.09244	0.2865
Δln (PBM)	- 0.0207	0.02083	-0.9087	0.3734
Δln (PBM_{t-1})	- 0.0247	0.02278	-1.18910	0.2471
Δln (shock)	- 0.0018	0.00241	- 0.77713	0.4454
Diagnostics			Statistic	Probability
Breusch-Godfrey serial correlation test.			1.8992	0.3927

Breusch pagan Godfrey heteroscedasticity test	13.5908	0.3276
Jarque – Bera test.	1.7772	0.4112
Ramsey Reset Test	0.6055	0.4565

The value of ECM (-1) is highly significant and shows that 86.97% of deviation from the equilibrium growth rate can be corrected in the following year. Further, the model has passed the residuals' stability and diagnostics test and normality. The CUSUM and CUSUM^2 are also given in the appendix to this chapter.

Table 14: Contribution of current (component) of public spending to the growth

Long run Coefficients				
Variable	**Coefficient**	**Std.Error**	**t- statistic**	**probability**
C	- 0.07894	0.08920	- 0.88500	0.3951
Ln (cur)	- 1.10787	0.45464	- 2.43678	0.0330**
Ln (texp)	- 0.10092	0.87975	- 1.82783	0.9107
Ln (pbm)	- 0.06934	0.03793	0.81244	0.0948***
Ln (shock)	- 0.01724	0.00822	- 2.09665	0.0600***
R square	0.88568			
Adjusted R^2	0.68824			
SE regression	0.05149			
AIC criterion	-2.84186			
SIC criterion	-1.91667			
F- Statistic.	4.48560			0.00712
D-Watson	1.8400			

ARDL (2 2 4 4 3) has been estimated based on equation 6. The lag structure is based on AIC with max lags 4 selected by the VAR selection order criterion. The table represents the impact of the current public spending component according to the economic classification. The calculated bund F-statistics for this model is 6.8256, greater than upper limit critical of 5.06 at a 1% significance level. Present government spending has a negative and statistically significant coefficient in the model. The present level of government expenditure has a detrimental effect on the expansion of the national economy. That the government spends most of its money on defense and interest payments could be a contributing factor. These two expenditures have a detrimental effect on the economy's performance since they are wasteful and do not contribute to the country's economic progress. The model's results corroborate those of previous studies that have characterized current public spending as a non-productive public good (Ali et al., 2013; D. Aschauer & Greenwood, 1985; Barro, 1990; Edward, 2013). Grier and Tullock, 1987, found a negative correlation between GDP growth and current government expenditures and a positive correlation between capital expenditures and GDP growth.

Table 15: Short-run impacts of the CURRENT public spending on economic growth

Variables	**C0efficients**.	**St. Error**	**t-statistics**	**probability**
ECM (-1)	-1.06219	0.19078	- 3.89261	0.0025
Δln (cur)	- 0.20633	0.25472	- 0.81004	0.4351
Δln (cur_{t-1})	- 0.75377**	0.26647	- 2.82868	0.0164
Δln (TEXP)	- 0.23633	0.39139	- 0.60383	0.5582
Δln ($TEXP_{t-1}$)	- 0.33887	0.34854	- 0.97211	0.3519
Δln ($TEXP_{t-2}$)	-0.17923	0.16257	- 1.10280	0.2936
Δln ($TEXP_{t-3}$)	0.16047	0.14978	1.07141	0.3069
Δln (PBM)	- 0.06965	0.02287	- 3.04508	0.0111
Δln (PBM_{t-4})	- 0.01651	0.02064	- 0.80028	0.4405
Δln (PBM_{t-2})	- 0.00425	0.02375	0.20080	0.8449
Δln (PBM_{t-3})	0.06566	0.01878	3.49612	0.0050
Δln (shock)	- 0.00460***	0.00294	- 1.99821	0.0710
Δln ($shock_{t-1}$)	- 0.00588**	0.00224	-2.83355	0.0163
Δln ($shock_{t-2}$)	0.00834*	0.00295	- 3.89261	0.0025

The long-run relationship among the variables included in the analysis is validated by the error correction term, which is -1.063 and is significant at a 1% significance level. So, the next year, the GDP will be back on track with its long-term growth rate, with a correction of 106%. The drastic change is illustrated by the model's error correction term. Banerjee et al.

(1998) states that this consistent long-run relationship is demonstrated by this sharp error correction.

$$cointeq = GDP_{ln} - (-1.1079Cur_{ln} - 0.1009TEXP_{ln} - 0.0693PBM_{ln} - 0.0172\text{shock\_ln} - 0.0789)$$

The stability and diagnostics test revealed that the model is stable and free from serial and heteroscedasticity problems, and the Ramsey and Jarque-Bera tests showed that the values are insignificant.

6.2. Composition of Public Spending and Its Impact on Poverty

In this section, the poverty impact of government spending has been analyzed, and it is expected that the composition of spending by the government will have a poverty reduction impact. In this model, the total spending by the government and spending on education and health, transportation and communication have been included in the model, while black market premiums and shock have been excluded from the model to measure the pure impact of the spending by the government.

Table 16: Long-run poverty impact of spending composition

Variable	Coefficient	Standard Error	t-stat	Probability
Ln (texp)	-4.8409**	1.9554	-2.4756	0.0267
Ln (TAC)	-0.7220**	0.2717	-2.6569	0.0188
Ln (health)	0.0755	0.5112	0.1478	0.8846
Ln (edu)	-2.1410*	0.6720	-3.1850	0.0066
Ln (def)	4.4098	1.0435	3.8625	0.0017
C	-12.7562	4.30517	2.9159	0.0133
R-square	0.9545			
Adj R Square	0.8409			
S.E Regression	1.4133			
AIC Criterion	-3.6851			
SIC Criteria	-4.4785			
F-Stat	8.4046			0.0075

The total expenditure by the government has a negative and significant sign, which means that this spending is negatively related to poverty. The more government expenditures, the less poverty there will be in the economy. Although this variable in all the previous models has been insignificant in the case of the growth impact and mainly it consists of the current spending by the government, which is considered to be unproductive here in this case where poverty is the dependent variable, this spending has significant impact further as it indicates more or less the current spending, therefore, current spending has some poverty reduction impact on the economy in the short run as well as in the long run.

Table 17: Short-run impact of public spending composition

Variable	coefficient	standard error	t-stat	probability
ECM (t-1)	- 0.2377	0.0665	- 3.7511	0.0032*
Δ (Pov_{t-1})	- 0.1914	0.1742	- 1.0990	0.3193
Δ Ln (texp)	9.3445	1.6108	2.2341	0.0691**
Δ Ln ($texp_{-1}$)	-4.7268	1.6218	- 2.5950	0.0409*
Δ Ln (TAC)	0.9266	1.1711	0.7912	0.4589
Δ Ln (tac_{t-1})	-3.0439	2.1491	-1.4163	0.2064
Δ ln (health)	- 2.9114	0.4269	- 3.5400	0.0122*
Δ ln (edu)	- 0.0060	1.4693	-1.4638	0.1936
Δ ln(edu_{t-1})	8.0720	4.4166	1.9748	0.0620***
Δ ln (def)	1.7229	8.1779	- 2.2894	0.0957**

$$Cointeq = Pov\_ln - (-4.8410texp\_ln - 0.7221tac\_ln - 0.0756health\_ln - 2.1411edu\_ln + 4.4099Def\_ln + 12.7563)$$

The bound test confirmed the model's long-run relationship between poverty and public spending composition. The calculated F-statistic is 5.779 more than the upper limit critical value of 4.68 at a 1% significance level. Furthermore, the government has adopted various poverty reduction strategies and programs to impact poverty; therefore, after 2001, a considerable amount has been spent in this sector, which has targeted poverty directly. The government's spending on education is also negative and significant, as it was expected that the expenditures in this sector would also impact poverty. This variable in the first model also had a growth impact along with the other variables and a poverty impact with the other variables. The expenditures on health have a positive and insignificant relationship with poverty, which means that in the long run, the expenditures on health do not significantly impact the country's poverty reduction. The expenditures on the physical infrastructure are also negatively related to poverty and significantly impact poverty reduction. While the expenditure on defence has a positive and significant relationship with poverty reduction

7. Conclusion

The main objective of this chapter is to determine the long-run and short-run dynamics of government spending composition for growth and poverty reduction, especially for Pakistan. The study has examined the impact of the subcategories of public expenditures, that is, current and capital spending by the government, and it has also included various expenditures according to the functional classification, that is, expenditures on education, health, expenditures on physical infrastructure, defence and also to capture the shocks in the economy the shock variable has been generated along with the black-market premium. The expenditures on health and education further have been disaggregated into three subcategories, each to gauge their impact on economic performance and poverty reduction. The study has adopted the ARDL framework. The study has used the Augmented Dicky Fuller and Philips- perron unit root test to check for order of integration among the variables and found that all the variables are I(1) except pbm, which is stationary at level. Using the ARDL bound testing approach, it has been concluded that there is a long-run relationship between public spending and economic growth. The subcategories of health and education also have a long-run relationship. The study has found that overall, the total expenditures have a negative growth impact on the economy. Moreover, it has been found that current expenditures negatively impact the country's economic performance, while capital spending positively impacts GDP growth. The expenditures on education and physical infrastructure also contribute to economic growth, while the black market premium and shock variable have negative economic performance. Health expenditures also negatively and significantly impact the economy in the long run. The subcategories of health and education expenditures have also been examined to note their economic growth impact.

The expenditures on research and curriculum development and subsidiary transportation services in the education sector have been found to have a growth impact on the economy. In contrast, the other two categories, the expenditures on primary and secondary education and the expense on tertiary education do not have any growth impact. On the other hand, the expenditures on health, including the subcategories of hospital services, the expenditures on patient health services, the expenses on research and development and all others, do not contribute to the country's economic growth. In the end, the impact of this composition is related to poverty. The relationship between the total public spending is negative, indicating that total government spending has contributed to the poverty reduction. Also, the expenditures on education, health and physical infrastructure significantly impact poverty reduction. The study recommends that the government reduce unproductive expenditures and promote capital spending. In Pakistan, most government expenditures ignore bureaucratic and most-needed sectors; hence, they do not significantly impact the development process. The results also recommend that a better and more comprehensive fiscal policy is needed for development. The government should not rely on the current expenditures; instead, it should promote its resources toward productive government expenditures, and the main social sectors of the economy should be at the centre of preferences—the better the composition, the more economic growth and less poverty in the economy. The paper has also investigated the relationship between the composition of public expenditures and its implication for economic growth and poverty reduction in the panel of South Asian countries from 1980-2022. Using the most recently developed methodology, it has been tried to find a mix of public spending that could lead to long-term economic growth and poverty reduction.

Based on the empirical results, it has been concluded that total and health spending were found to have a positive and significant impact on the economy. In contrast, the expenditures on education, transportation, and communication, as well as the black market premium and shock variable, have been found to have a negative growth impact. In the other categories of total public spending, like current and capital spending, current spending has been found to positively affect the economy's growth rate in South Asian countries against the general assumption that capital spending adds more to the growth as compared to the current spending by the government. In the case of developing countries and mainly in the present study, the capital expenditures that have been thought to be the backbone of development may have been excessive in amount and hence retarding the pace of development at the margin. The study also confirmed that the developing countries governments have been misallocating capital spending at the cost of current expenditures. The study also confirmed that the current expenditures imply poverty reduction in South Asian countries as the coefficient of current spending is negatively related to poverty as opposed to capital spending. The spending on education and health, as well as total spending by the government and GDP growth rate, have also contributed to reducing poverty in South Asian countries.

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