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Government Expenditure And Economic Growth: Analyzing The Effects Of Government Spending On Public Goods, Infrastructure, Healthcare, Education, And Its Long-Term Impact On Economic Growth

Dr. Bashir Ahmad
Assistant Professor, Department of Economics, ICP.
Email: b.ahmad3@icp.edu.pk

Ms. Maria waheed
M. Phil. Scholar, Department of Economics, ICP.
Email: mariaawan859@gmail.com

Mr. Muhammad Nouman Dawood
MSc Economics , Business School, University of Exeter.
Email: md894@exeter.ac.uk

Fayez Ahmad
M.Phil. Scholar, Department of Economics, ICP.
Email: fayezahmad939@gmail.com

Dr. Nargis Bibi
Assistant Professor, Jinnah College for Women, University of Peshawar.
Email: nargisikram@uop.edu.pk

Abstract
This study empirically investigates the impact of government expenditure on economic growth. It is in the context of spending on education, health, investment, and trade openness. Using panel data analysis, for 15 selected countries, both developed and developing, over a defined time period of 2010-23. The approach uses 'Pooled OLS', 'Fixed Effects (FE)', and 'Random Effects (RE)' models. Diagnostic tests backing these models include 'panel unit root', 'Pedroni and Kao' cointegration, and the 'Hausman' specification test. The findings show that economic growth is considerably and favorably influenced by education, health, and investment. However, the trade openness, although positive, shows a statistically weaker effect. Model selection tests confirm the Fixed Effects model as the most appropriate estimator. The findings underscore the importance of targeted public spending in human capital and infrastructure. It will help foster long-term economic development. Based on the analysis, the study offers policy recommendations that emphasize enhanced investment in social sectors. Further, improved regulatory frameworks for capital formation, and more strategic trade integration policies will help boost the economic progress

Keywords: Economic Growth, Government Expenditure, Panel Data Analysis, Fixed Effects Model, Investment, Education, Health, Trade Openness,Hausman Test, Cointegration.

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Introduction

Economic growth stands as a fundamental goal for policymakers across the globe. It shapes national development agendas and influencing the design of fiscal and macroeconomic strategies. For both advanced and developing economies, the pursuit of sustainable and inclusive economic expansion is related to the public spending. The government's ability to mobilize and efficiently allocate public resources are decisions of utmost importance. This is an era focused on development. Nations are working toward achieving higher standards of living, reducing poverty, improving productivity, and increasing competitiveness in the global arena. Therefore, conducting c research on these relationships, across nations, over a recent timeframe, became obligatory. Thus, In this regard, the study focuses on the objective to examine the relationship between expenditure and growth, to enhance the understanding of the subject matter. Nonetheless, several contextual factors affect the efficacy of such spending. These include macroeconomic stability, absorptive capacity, governance frameworks, and institutional quality. Economic analysis and policy formulation focus on understanding various forms of public expenditure and its effects on economic growth.

In the era of globalization, the global economic landscape has undergone significant transitions. The 2008 global financial crisis served as a major turning point. It has prompted widespread fiscal stimulus. stimuli which the governments sought to stabilize financial systems with and revive demand. Subsequently, the discourse on the magnitude and composition of public expenditures becomes signicantly important. The COVID-19 pandemic compelled the government to incur substantial expenditures It increased the expenses associated with health issues and economic recessions. This way, contributing billions of dollars to the global budget.More recently, economies have faced inflationary shocks. Moreover, geopolitical disruptions, and supply chain uncertainties, recently erupted, demanding coordinated fiscal responses.

These overlapping crises, have not only tested the fiscal resilience of governments, but also exposed the spendings outcomes. Moreover, these varied outcomes of similar spending policies varied across countries.In some contexts, substantial output gains have been associated with extensive public investment. Large-scale industry influences economic development and employment opportunities. There have been instances where such initiatives have been unsuccessful, resulting in increased debt. The varying outcomes underscore the need of examining not just the total government expenditure

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but also its allocation across industries and its long-term economic impact.

Moreover, the global policy environment is increasingly influenced by the demands of sustainable development, digital transformation, and climate resilience—all of which require well-targeted public investment. This reinforces the relevance of examining how specific types of government expenditure—such as those on education, healthcare, infrastructure, and capital formation—contribute to macroeconomic performance. Empirical study examining these connections using comprehensive cross-country panel data over an appropriate time period is thus crucial for informing subsequent fiscal policies.

This work is grounded in a broader political and academic context. The objective is to analyze and improve our understanding of the relationship between spending and growth.It is done by analyzing the impact of different categories of government spending on economic growth. for this purpose, a multi-country panel dataset from 2015 to 2023, is used. By doing so, this study seeks to provide empirical clarity. This will help identify components of public spending most effectively drive growth and under what macroeconomic conditions their impact is maximized.

Motivation of the Study

The central motivation for this research arises from the persistent ambiguity and contradictory findings about government spending and economic growth. While many governments prioritize large-scale investments. These allocations are in education, health, infrastructure, and public services as tools for economic transformation. Nevertheless, the actual effectiveness of such expenditures remains contentious. The heterogeneity of outcomes across countries suggests the need for a deeper, cross-country comparative analysis. Certain countries, in this regard, experiencing robust growth alongside expanding public expenditure, while others remained stagnant despite large fiscal expenditures.

Moreover, many more countries, recently, grapple with rising debt burdens, inflation, and global uncertainties. Therefore, the pressure to allocate scarce public resources more efficiently is immense. For fiscal authorities and policy institutions, key question is no more just related to spending influences on growth. Rather, it's the types of expenditures, which matters the most. It is of utmost importance to know public spending role in

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shuffling macroeconomic variables - like trade and investment. Moreover, analyzing conditions, where public spending become growth-enhancing, are necessary. Further, this research is further motivated by the fact that the current literature tends to be more country-specific. There is diversity in fiscal outcomes across developed economies and emerging economies. It underscores the need for a comparative, data-driven examination of expenditure-growth dynamics. Few studies have systematically assessed the comparative role of disaggregated government expenditure. This study fills that gap by employing a rigorous panel data methodology, covering multiple diverse economies, over a two-decade span.

Significance of the Research

This study, is important from both empirical and policy perspectives. From an empirical standpoint, it adds to the body of knowledge, by including disaggregated public spending components into growth models. Advanced 'panel econometric methods' are used for this goal. The research also considers cross-sectional dependency, heteroskedasticity, serial correlation, and possible endogeneity. These diagnostic tests, improve the accuracy of model used, by correcting statistical problems, usually overlooked in prior studies.

From a policy standpoint, the results will provide useful outcomes. Especially, in light of limited financial resources and conflicting development goals. it will enable the finance ministry, international organizations, and legislators to deploy public resources to efficiently enhance growth.

Research Objectives

The study tests the following theories based on its goals and previous research:

1. To evaluate the impact of education, health, and infrastructure spending on GDP growth in develpped and emerging economies.
2. To assess the the impact of trade openness, investment, and public capital formation in on economic growth in these economies.

Conceptual Frame

The conceptual framework of the research suggests a causal link between government spending components—education, health, investment, infrastructure—and economic

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development (GDP growth rate). Trade openness and gross capital creation are seen as control factors affecting growth via foreign and domestic channels. The model presumes that:

Dependent Variable:

Annual % GDP Growth

Independent Variables:

Government spending on education as a percentage of GDP

Health spending by government (% of GDP)

Investment public (% of GDP)

Openness to trade (imports plus exports as percentage of GDP)

Gross capital creation (% of GDP)

Allowing for fixed or random effects based on the results of diagnostic and model selection tests, the framework captures both direct and indirect consequences of fiscal variables on economic performance across nations and across time.

LITERATURE REVIEW

The nexus between government expenditure and economic growth is long been a standing subject of debate in macroeconomics. Classical and neoclassical economists, such as Smith (1776) and Solow (1956), posited that government intervention should be limited. They emphasized the role of capital accumulation and technological progress. In contrast, Keynesian theory underscores the positive role of fiscal policy. The theory focused particularly government spending. The role of budgetary allocation in stabilizing output and stimulating growth, during economic downturns.

Barro (1990) introduced a model that distinguished between productive and non-productive public expenditures. Barro argued that only the spending on infrastructure, education, and health can foster long-run growth. His endogenous growth model laid the groundwork for empirical studies. He explored the composition of government expenditure rather than its aggregate size. Empirical studies on the subject offer mixed results, when studying overall public spending impact on growth. Landau (1983) found that excessive public expenditure tends to inhibit growth in developing countries. while Devarajan, Swaroop, and Zou (1996) emphasized the importance of expenditure composition. They noted that in many low-income countries, current spending may

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crowd out productive investment.

Sahoo et al. (2010), analyzing Asian economies. Their study observed that public investment in infrastructure positively correlates with output expansion. In contrast, studies like Gwartney et al. (1998) highlighted that larger government size often correlates negatively with growth. The statement is more true when there is misallocation or inefficiently resources allocated.

Public spending on education has consistently been linked with long-term productivity gains and human capital formation. Barro and Lee (2013) concluded that countries with higher educational attainment levels experience faster growth. Hanushek and Woessmann (2007) added that the quality of education (measured through cognitive skills) is more critical than mere enrollment or expenditure levels.

Government expenditure on healthcare enhances labor productivity by improving population health. Bloom, Canning, and Sevilla (2004) showed that a one-year increase in life expectancy can raise GDP per capita by 4%. However, inefficiencies in health systems may reduce the effectiveness of such spending in developing countries (Afonso and St. Aubyn, 2011).

Aschauer (1989) found a strong link between public infrastructure investment and productivity growth in the U.S. His study suggested that infrastructure spending acts as a complement to private investment. Calderón and Servén (2010), confirmed that infrastructure significantly influence long-run growth. using panel data for over 100 countries, he conclude that that both the quantity and quality of infrastructure support growth.

Recent literature increasingly relies on advanced panel econometric techniques . To address heterogeneity, endogeneity, and cross-sectional dependence, Panel is good choice. Studies such as Baldacci et al. (2008) employed dynamic panel GMM models. With GMM, the lagged effects of fiscal variables are effectively captured to analyze its impact on growth. Similarly, Dabla-Norris and Minoiu (2006) applied system-GMM to explore the effectiveness of social spending. They cocluded a positive role of social spending in fostering inclusive growth.

Furthermore, cross-country panel data studies emphasize the importance of controlling for fixed and random effects. It helps avoid omitted variable bias. Hausman tests and diagnostic checks (heteroskedasticity, serial correlation, and cross-sectional dependence)

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are now standard in identifying the most appropriate estimation technique (Baltagi, 2008; Arellano & Bond, 1991).

Research Gaps

Despite the extensive body of research, there are still notable gaps in research in this domain. First, there is no consensus on the optimal size and composition of government expenditure for growth. This notion becomes more meaningful in the context of across income groups and institutional. Second, most studies fail to distinguish the impact of different kinds public spendinsg in short-run and long-run im. Third, many previous works overlook the interaction effects between sectors. The impact to underscore the joint impact of education and health investments in influencing productivity.

MODEL and METHODOLOGY

This research utilizes a Panel Data Regression Model to empirically examine the correlation between government spending and economic development. The data set used includes OECD and developing economies for the period of 1995-23. The research examines several types of government expenditure. The infrastructure, healthcare, education, and public services in these countries and and their respective and collective impacts on GDP growth. The article uses the data sources of WDI, WB, GFS, PWT, UNESCO and WHO Statistics. The data is analysed in the subject context for the following countries:

Australia, Brazil, Canada, France, Germany, India, Indonesia, Japan, Mexico, Russia, South Africa, South Korea, Turkey, United Kingdom, United States

Model Specification

The baseline panel data regression model is articulated as follows:

$$GDP_{it} = \alpha + \beta_1 INFRA_{it} + \beta_2 HEALTH_{it} + \beta_3 EDU_{it} + \beta_4 PUBSERV_{it} + \beta_5 INV_{it} + \beta_6 INTRADEV_{it} + \mu_i + \varepsilon_{it}$$

GDP_{it}: Real GDP growth rate of nation i at time t
$INFRA_{it}$: Government spending on infrastructure (% of GDP)
$HEALTH_{it}$: Government spending on healthcare as a percentage of GDP
EDU_{it} : Government spending on education as a percentage of GDP
$PUBSERV_{it}$: Expenditure on general public services as a percentage of GDP
INV_{it}: Gross capital creation as a percentage of GDP
$INTRADEV_{it}$: Trade openness (exports plus imports as a percentage of GDP)

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μ_i: Country-specific fixed effect
ε_{it}: Error term

Estimation Methodologies

To tackle difficulties of heterogeneity, endogeneity, and cross-sectional dependency, the following estimate approaches are utilized:

A. Panel Unit Root Tests
    a. Levin-Lin-Chu (LLC),
    b. Im-Pesaran-Shin (IPS),
    c. Fisher-type ADF and PP tests.
B. To conduct the Panel Cointegration Tests, this study utilizes Pedroni and Kao tests to evaluate the equilibrium relationships (long-term) among variables.
C. The Hausman test is used to determine the appropriate choice between the better panel data models (fixed effects vs random effects models).

EMPIRICAL RESULTS AND DISCUSSION

This section presents the empirical results of a research that on Government Expenditure and Economic Growth, "Analyzing the effects of government spending on public goods, infrastructure, healthcare, education, and its long-term impact on economic growth". The data set used includes OECD and developing economies for the period of 2015-23.

Pooled OLS Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	P-value
Constant	0.984	0.124	7.94	0.000
Education	0.145	0.052	2.79	0.005
Health	0.238	0.063	3.78	0.000
Investment	0.311	0.070	4.44	0.000
Trade	0.087	0.048	1.81	0.072

The pooled OLS estimation reveals that all the included variables ave a positive association with growth. These variables include education, health, investment, and trade. The constant term indicates a significant baseline value when all explanatory variables are held at zero. Education as independent variable, is concluded to positively contributes to economic growth. The relationship is statistically significant, which suggests that higher investment in education will lead to favourable economic outcomes. Again,

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'health expenditure' reveals strong and statistically significant effect - positive. It advocates the idea that better health services promote productivity and growth.

Investment appears to be the most influential among the explanatory variable. It indicates a robust and highly significant impact. Therefore, it is concluded that investment add to capital formation, which is a key engine of growth. The effect of trade, while positive, is weaker. The relationship is marginally significant. This suggests that trade openness may play a role in enhancing growth. However, its influence is less pronounced compared to human capital and investment.

As, pooled OLS does not account for country-specific or time-specific effects. It only assumes homogeneity across cross-sections. Therefore, its estimates might suffer from omitted variable bias due to unobserved heterogeneity. Given these limitations, we will conduct Hausman test to conclude whether fixed effect or random effect model is more suitable. But before doing hausman test we will do cointegration and panel unit root tests.

Unit Root, Cointegration and hauseman Test results

Panel Unit Root Tests

Test	Statistic	P-Value	Conclusion
LLC Test (GDP Growth)	-2.18	0.013	Reject Null (Stationary)
IPS Test (GDP Growth)	-3.10	0.000	Reject Null (Stationary)
Fisher ADF (GDP Growth)	75.45	0.002	Reject Null (Stationary)
Fisher PP (GDP Growth)	70.00	0.005	Reject Null (Stationary)

Panel Cointegration Tests

Pedroni Test (GDP Growth, Government Expenditure):

Statistic	Value	P-Value	Conclusion
Panel v-statistic	2.85	0.002	Cointegrated
Panel rho-statistic	-3.50	0.001	Cointegrated
Group rho-statistic	-3.25	0.003	Cointegrated

The panel unit root test results show that GDP growth is stationary. All the tests conducted give the same result. The Levin-Lin-Chu (LLC) test yields a test statistic of –

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2.18 (p-value of 0.013), leading to the rejection of the null hypothesis of a unit root. Similarly, the Im-Pesaran-Shin (IPS) test reports a statistic of –3.10 (with a p-value of 0.000), confirming stationarity. The Fisher-type tests a with ADF version statistic of 75.45 (p = 0.002), also support this conclusion . Finally, on the same lines, the PP version shows a statistic of 70.00 (p = 0.005). These results collectively confirm that the GDP growth series is stationary.

Moving to the cointegration analysis, the Pedroni test confirms the existence of a long-run equilibrium relationship between GDP growth and government expenditure. The panel v-statistic is 2.85 with a p-value of 0.002. The panel rho-statistic is –3.50 (p = 0.001). The group rho-statistic is –3.25 (p = 0.003). All values are statistically significant, leading to the rejection of the null hypothesis of no cointegration. Therefore, it is concluded that these exists a stable long-run association between these variables.

This result indicates that the fixed effects model is more suitable. It will account for the correlation between individual-specific effects and the explanatory variables, offering more 'reliable' and 'consistent' estimates.

Random Effects (RE) Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	P-value
Constant	0.901	0.118	7.63	0.000
Education	0.134	0.051	2.63	0.009
Health	0.226	0.061	3.70	0.000
Investment	0.305	0.069	4.42	0.000
Trade	0.081	0.047	1.72	0.086

The Random Effects (RE) estimation results are more or less the same as that of the pooled panel data results. It reveals the constant term is statistically significant with a coefficient of 0.901 and a p-value of 0.000. It indicates a strong positive baseline level of GDP growth, provided that all other variables are held constant. Education has a positive and statistically significant effect on GDP growth. It has a coefficient of 0.134 and a p-value of 0.009. Increased investment in education contributes to economic growth.

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Health also shows a strong and significant positive association with GDP growth. With a p-value of 0.000, the coefficient is 0.226. This suggests that expenditures in healthcare and improved health results greatly enhance economic success. The cause is maybe the potential rise in labor force efficiency and the decrease in production losses brought on by disease.

Investment exhibits a robust positive impact on GDP growth, with a coefficient of 0.305 and a p-value of 0.000. This confirms the classic economic view that capital formation drives output expansion, reflecting the critical role of both public and private investment in fostering development. Trade openness has a positive impact on GDP growth. Nevertheless, it is relatively weaker and marginally insignificant impact . Its coefficient is 0.081 with a p-value of 0.086. it is obvious that 0.08 value is just above the conventional 5% significance threshold. This implies that commerce might foster development. The impact, however, is not statistically significant and may be caused by structural imbalances.

The random effects model shows on the whole that major engines of economic development are education, health, and investment. Trade demonstrates a good but less important influence. These results underline the need of human capital growth. The growth process depends on both capital accumulation and capital creation.

Befoe finalizing this paper uses the model selection test results. It will help identify the most suitable econometric model for panel data analysis, using multiple criterions. It will ensure that the estimations are efficient, unbiased, and consistent.

Model Selection Tests

Test	Chi-sq / F-statistic	P-value	Decision
F-test (FE vs Pooled OLS)	34.72	0.000	Reject Pooled in favor of FE
LM Test (RE vs Pooled OLS)	29.65	0.000	Reject Pooled in favor of RE
Hausman Test (FE vs RE)	12.34	0.002	Reject RE in favor of FE

The F-test comparing the 'Fixed Effects (FE) mode'l with 'Pooled OLS yields'. F-test resulted statistic of 34.72 and a p-value of 0.000, leads to the rejection of the null hypothesis that pooled OLS is appropriate. It suggests that the fixed effects model is statistically superior. It implies that unobserved heterogeneity across countries or time is significant. Therefore, these must be accounted for using fixed effects.

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Similarly, the Breusch-Pagan Lagrange Multiplier (LM) test comparing the Random Effects (RE) model with Pooled OLS. It produces a test statistic of 29.65 and a p-value of 0.000. This result also rejects the pooled OLS model. This confirms that random effects modeling is preferable when panel-specific effects are present. Finally, the Hausman test, which compares the Fixed Effects and Random Effects models, yields a test statistic of 12.34 and a p-value of 0.002. Since the p-value is below the 5% significance level, the null hypothesis that the random effects model is appropriate is rejected. Therefore, the fixed effects model is statistically favored. It addresses potential correlation between individual effects and regressors.

In summary, all three tests favors Fixed Effects model, as the most suitable for this dataset. This conclusion is important. Because it ensures the estimation method properly controls for country-specific and time-invariant characteristics.

Fixed Effects (FE) Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	P-value
Education	0.122	0.049	2.49	0.013
Health	0.217	0.058	3.74	0.000
Investment	0.298	0.066	4.51	0.000
Trade	0.075	0.046	1.63	0.103

The Fixed Effects (FE) estimation results are more or less the same as that of the pooled panel data results. It indicates a strong positive baseline level of GDP growth, provided that all other variables are held constant. Education has a positive and statistically significant effect on GDP growth. It has a coefficient of 0.122 and a p-value of 0.013. Increased investment in education contributes to economic growth. Health also shows a strong and significant positive association with GDP growth. With a p-value of 0.000, the coefficient is 0.217. This suggests that expenditures in healthcare and improved health results greatly enhance economic success. The cause is maybe the potential rise in labor force efficiency and the decrease in production losses brought on by disease.

Investment exhibits a robust positive impact on GDP growth, with a coefficient of 0.298 and a p-value of 0.000. This confirms the classic economic view that capital formation drives output expansion, reflecting the critical role of both public and private investment in fostering development. Trade openness has a positive impact on GDP growth.

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Nevertheless, it is relatively weaker and marginally insignificant impact . Its coefficient is 0.075 with a p-value of 0.103. it is obvious that 0.103 value is just above the conventional 5% significance threshold. This implies that commerce might foster development. The impact, however, is not statistically significant and may be caused by structural imbalances.

The fixe effects model shows on the whole that major engines of economic development are education, health, and investment.

CONCLUSION AND RECOMMENDATIONS

This panel data analysis investigates the impact of key public sector variables on economic growth across a sample of countries using Pooled OLS, Fixed Effects (FE), and Random Effects (RE) models. These variable are education, health, investment, and trade. After conducting a series of diagnostic and model selection tests, including unit root, cointegration, and Hausman tests, the Fixed Effects model emerged as the most appropriate estimator. The analysis confirms that education, health, and investment have a statistically significant and positive influence on economic growth.Although trade openness's impact is beneficial, it is not statistically significant at conventional levels.

The results highlight the vital need of continuous public investment. This allocation must be focused on human capital and infrastructural development. Improvements, in education and health, will help production and labor efficiency. Further, this kind of allocation of out of public spending will boost long-term development; capital accumulation and will promote investment.

REOMMENDATIONS

Governments need to allocate more resources to education. This rise should not only be in terms of access but also in quality and significance. It should guarantee consistent productivity increases by matching talents with needs of the labor market. Public health infrastructure, access to affordable healthcare, and preventative care initiatives should get first attention. It will help to promote equitable development and lower productivity losses by improving worker health. Policies supporting infrastructure, technology, and innovation both domestically and abroad should be encouraged. Stable macroeconomic

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systems and investment-friendly laws may help to achieve this. Though trade indicates a good link with growth, its statistical irrelevance points to the need of more efficient trade policy. Nations should investigate focused trade changes. It will boost value-added exports and lower structural inefficiencies.

Development plans should be customized to national settings given the diversity seen between nations. It should consider regional goals, demographic patterns, and institutional capacity.

All things considered, the findings provide strong proof for policy-makers to deliberately direct public expenditure. Particularly into industries that provide significant returns in growth and development in underdeveloped and transitional countries.

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