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Government Expenditure and Economic Growth in Tanzania

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Abstract

This study examines the impact of government expenditure on economic growth, focusing on health, infrastructure, education, and agriculture in Tanzania. The data from 1970–2020 were analysed using the STATA software. Government expenditure on education, health, agriculture, and infrastructure sectors were the independent variables, while GDP was the dependent variable. Wagner's law of increasing state activity and Keynesian economic theory were used to guide the study. Unit root test and Johansen co-integration test were conducted. The Johansen co-integration test results indicated the absence of a long-run relationship between all explanatory variables and economic growth. However, the ARDL model revealed that government health expenditure had a low effect on economic growth compared to infrastructure, education, and agriculture expenditures; all of which had higher effects. The study recommends that more government resources be spent on substantial infrastructure.

Keyterms: government expenditure, economic growth, ARDL, Tanzania

1. Background Information

Tanzania faces difficulties in raising economic growth due to insufficient resources. The main problem is how to finance government expenditure with low revenue collection, which is grounded in a low level of economic development and poor public services. The impact of taxation on economic growth is a major concern of policymakers, tax experts, researchers, and academics (Maganya, 2020). Empirical evidence shows that an optimum utilization of government expenditure may influence economic growth (Zouhar et al., 2021). Tanzania's standard tax to Gross Domestic Product (GDP) ratio is less than 20%, which is usually measured below the entrance of 20% as the WBG (2021) predictable collection on the standard of 11.5% tax to GDP. This is also below the entrance in the East Africa region, and 18.6% of Sub-Saharan Africa (SSA). This situation is caused by less efforts to support economic growth (WBG, 2019), and poor public services. This is even though the World Bank announced that Tanzania's GNP per capita increased from US$1020 in 2018 to US$1080 in 2019, more than the global threshold for lower middle-income status, which is about 12.5%; and for Sub-Saharan Africa, which is 18.6%.

The allocation of government expenditure and income distribution should be strategically geared towards enhancing tax revenue collection in a country to uplift the living standards of its citizens. According to a study by Babatunde (2018), increased government spending in key areas such as education, health, water and

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sanitation, agriculture, and physical infrastructure—made possible through enhanced tax revenues—tends to have a positive impact on the overall well-being of the population. Consequently, it is widely acknowledged that judicious government expenditure serves as a crucial tool for fostering economic growth, as emphasized by Ahmad and Loganathan (2015). Moreover, Machogu (2015) highlights that an improvement in economic growth invariably reinforces revenue generation for the government without imposing additional burdens on compliant taxpayers. Conversely, insufficient tax revenue hampers the fiscal capacity of the government to allocate funds to essential developmental priorities. A higher revenue base enhances the government's ability to allocate resources effectively, thereby increasing the likelihood of improving the well-being of its citizens.

An economic slowdown is linked to reductions in the amount of public and private funds available to be invested in economic sectors (Kachunga & Cairo, 2022). These sectoral investments in turn improve human capital and other resource potentials useful for long-term economic growth. Tanzania, like most other developing countries, faces numerous economic challenges in striving to achieve sustainable economic growth and development through taxation (Maganya, 2020). Even though the economic growth path of Tanzania is high, as seen in Figure 1, the government's efforts to increase revenue and expenditure performance are still low (Lulu & Lei, 2019; Kira, 2017). A high-growth economy in a low-tax revenue country is a paradox that needs scrutiny on what are the actual sources of economic growth. As the government spends its scanty revenues sectoral-wise, this study explored the links that exist between sectoral spending and growth.

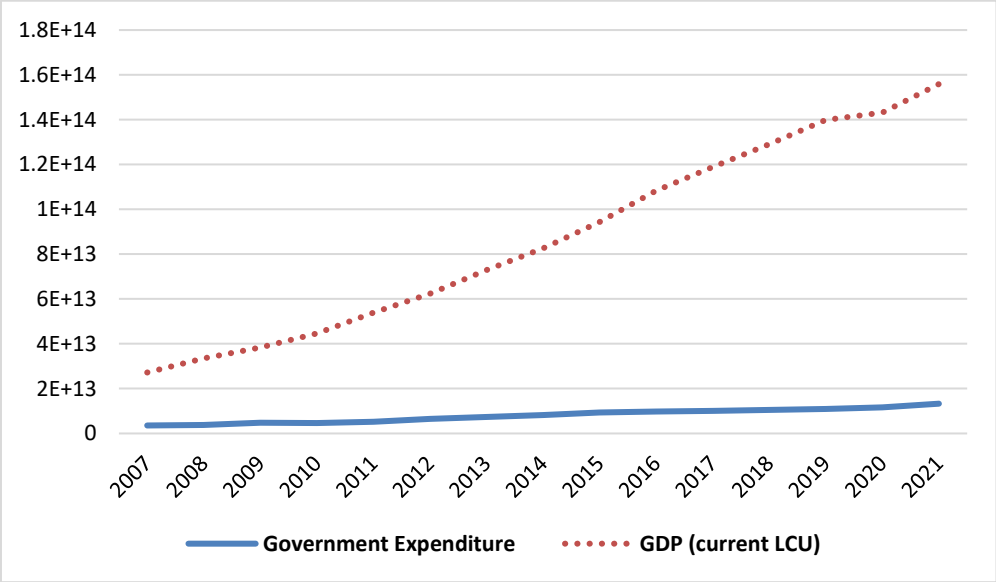

Figure 1: GDP and Government Expenditure
Source: World Development Indicators, 2022

Several studies have examined the impact of government expenditure on economic growth (Chijioke & Amadi, 2020; Lian & Seng, 2020; Ngobeni & Muchopa, 2022; Azolibe et al., 2020; Suwandaru et al., 2021). However, the findings of these studies have been inconclusive with negative and positive results. Nevertheless, some empirical evidence shows that an optimum utilization of government expenditure may influence economic growth (Zouhar et al., 2021).

There is scarce knowledge on the effect of sector-specific government expenditure on economic growth in developing countries, particularly Tanzania (Salim, 2017). In this regard, this paper seeks to examine the link between government expenditure on the sectors of health, hard infrastructure, free education, and agriculture to economic growth in Tanzania. The focus on the four sectors follows from their macroeconomic significance to the Tanzanian economy. The knowledge generated from this study has the potential to help the government focus its spending on priority sectors to enhance economic growth.

The rest of the paper is structured in six parts. Following this introduction, part two presents a survey of the literature; while the methodology is presented in part three. Part four presents the findings of the study, and part five discusses the study findings. The last part presents the conclusion and recommendations.

2. Literature Reviews

2.1 Theoretical Background

This study was guided by Adolph Wagner's (1893) law of increasing state activity and the Keynesian economic theory, originally founded by Richard Maynard Keynes (1936). The Wagner's law argued that public expenditure increases with national income. In its founding, Wagner observed that the growth of an economy will be accompanied by an increase in public expenditure (Irandoust, 2019). A similar view is held by the Keynesian economic thinking, using the idea of fiscal policy, that government spending is instrumental in stipulating economic growth (Parui, 2020). In Turkey, Arestis et al. (2020) verified the two theories on the relationship between government expenditure and output. Similar works are from Pakistan (Mushtaq et al., 2023), Egypt (Eldemerdash & Ahmed, 2019), as well as from Armenia and Spain (Sedrakyan & Varela-Candamio, 2019): all with mixed conclusions. This study adopted and tested the two frameworks in the case of Tanzania, to assess the effect of sector-specific government expenditures on economic growth.

2.2 Empirical Review

Mosha et al. (2021) investigated the effect of public health expenditure on the economic growth of Tanzania based on secondary dataset from 1980 to 2017. The analysis of data was facilitated with the aid of co-integration and autoregressive distributed lag model in the error correction model framework. The study found a positive effect of public health expenditure on economic growth in the short-run, while in the long-run the effect was not significant. Even Cooray (2009), coined public health in the study of government expenditure on education and health. The study concluded that an increase in the productivity of labour raises the growth of nationwide productivity.

Amaghionyeodiwe (2018) investigated the effect of government spending on education on economic growth in West African countries by using a time series data from 1990 to 2016. The analysis of the data was conducted using co-integration and causality test analysis. The independent variable (spending on education) was found to positively influence economic growth in a statistically significant way. In Nigeria, based on a time series data of 37 years, Chijioke and Amadi (2020) also analysed the effect of government infrastructures on agricultural spending on economic growth. The weighted least squared regression, as well as the co-integration test, were used in data analysis; and the result showed that government spending on agricultural infrastructures had an inverse (negative) impact on economic growth. The study concluded that an element of fiscal illusion was observed in government spending on agriculture, indicating that the government was not contributing as much as the private sector in spending on agriculture in Nigeria.

According to Meheus and McIntyre (2017), it would be more suitable to express government expenditure on health concerning GDP rather than universal government expenditure. The study, which employed the time series data of 2000–2018, revealed that there is a long-term association between government expenditure in the infrastructure sector and economic growth in Ghana, with a p-value of 0.0001. Hodey and Senadza (2022) established that government expenditure on education increases the efficiency of labour, and in turn raises national development. In the same way, government expenditure on education decreases the cost of manufacturing and increases the profitability of companies, thereby increasing a nation's economic growth. Barlas (2020) analysed the impact of expenditure compositions on economic growth in Afghanistan, using the ARDL model. The unit root test and Johansen co-integration test were checked. The results show that dependent and independent variables are stationary at their level and first difference. Furthermore, these variables were integrated. The estimated coefficients of education and infrastructure were found to affect the economic growth rate directly. The study concluded that the government should increase expenditure on education and infrastructure to accelerate economic growth.

However, in a study on the effects of regional economic integration on regional trade in Africa, Mohammed and Magai (2019) noted the potentiality of Tanzania in the agricultural sector and other natural resources that have essential inputs in productive activities that could assist the country to participate in regional and global economies. Furthermore, Magai (2016) recommends the opportunities to capitalize more on private investment for both local and foreign markets since agriculture accounts for almost a quarter of GDP. This is again supported by Mohamed and Magai (2019), who reckoned policymakers to realize the importance agriculture for inclusive growth.

3. Methodology

The study covered time series data from 1970–2020, whereby regression was applied to validate the study for the named period, and the model was developed. The data was obtained from the National Bureau of Statistics (NBS) database, the Bank of Tanzania

(BoT), the International Monetary Funds (IMF), and the World Bank (WB). It employed testing procedures of the unit root tests and Autoregressive Distributed Lag (ARDL) to capture the dynamic effects of the lagged variables. This enabled the analysis of the dynamic relationships with time series data in a single-equation framework. The regression equation was applied to establish the relationship between GDP, as the dependent variable; and expenditure on health, education, infrastructure and agriculture as the independent variables. Thereafter, the variables were tested to examine the level of significance at 5% decision criteria, and the developed model was also tested for co-integration. The unit root test and Johansen test were not only applied to validate the model, but also to ensure that the data were reliable for sound and valid discussion of findings (Musaba, 2010).

4. Findings of the Study

4.1 Descriptive Statistics

Table 1 shows that the standard deviations are largely proportional to their mean, respectively. This may indicate a high variability in four variables, including education, agriculture, infrastructure, and GDP. However, the extent of deviation, whether high or low, will depend on the application of the study.

Table 1: Summary Statistics

Stats/Expenditure	Infrastructure	Health	Education	Agriculture
Mean	25.62333	31.50686	42.86333	42.95098
Standard deviation	8.053449	8.044962	12.94403	13.35809
Maximum	.841	.014	.841	.841
Minimum	.423	.093	.423	.423
Skewness	.5122877	.1868333	-1.01414	-.8527011
Kurtosis	2.944805	2.127478	3.36403	3.173025

Table 1 reports descriptive statistical coefficients for expenditure on infrastructure, health, education, and agriculture with the mean value of 25.62, 31.51, 42.86, and 42.95, respectively. The observation is based on the rule of thumb on the interpretation of skewness, which states that a skewness value greater than (1) or less than (-1) indicates a highly skewed distribution. A value between 0.5 and 1, or -0.5 and -1, is moderately skewed. A value between -0.5 and 0.5 indicates that the distribution is fairly symmetrical. With this observation, the null hypothesis was not rejected, implying that the data follow the normal distribution.

4.2 Stationarity of Time Series Data

It was significant to verify the stationarity properties of the study variables to avoid the risk of unreliable results and spurious, which lead to poor understanding and forecasting in regression analysis. Therefore, both Phillips-Perron (P-P) (1988) and the ADF (1979) methods were conducted to check for a unit root for all variables in different operations. In carrying out the stationary tests by considering drift and trend in the series, as seen in Table 2, the testing results indicate that the hypothesis of a unit root cannot be rejected in all variables in levels. Therefore, it is concluded that all variables are non-stationary in the level form at 5% levels of significance.

Table 2: ADF Test and Philips-Perron (P-P) Test for Stationarity

Variables	At Level			
	ADF Test		Phillips-Perron Test	
	Test Statistics	*Critical Value*	*Test Statistics*	*Critical Value*
Gross Domestic Product (GDP)	-1.398	-2.952	-1.582	-2.930
Govern. Expenditure on Health	-1.398	-2.952	-1.572	-2.950
Govern. Expenditure on Education	-1.741	-2.952	-2.290	-2.250
Govern. Expenditure on Agriculture	-1.398	-2.952	-1.482	-2.350
Govern. Expenditure on Infrastructure	-1.741	-2.952	-1.782	-2.850

Source: STATA Output, 2022

Referring to the results indicated in Table 2, the study performed the same test at different levels. This is to say, after the first differences, all variables were stationary at 5% levels of significance (Table 3). Therefore, these variables were integrated at order one 1(1).

Table 3: Stationarity Test

		Critical Value			
Augmented Dickey-Fuller (ADF) Test	**z(t)**	**1%**	**5%**	**10%**	**Decision**
GDP	0.0068	-3.581	-4.875	-3.372**	Reject Ho
GE on health	0	-2.937	-4.875	-2.372**	Reject Ho
GE on education	0.0001	-3.676	-5.069	-1.378**	Reject Ho
GE on agriculture	0.0005	-2.678	-4.875	-2.328**	Reject Ho
GE on infrastructure	0.0062	-3.862	-5.069	-4.952**	Reject Ho
Phillips-Perron (P-P) Test	**z(t)**	**1%**	**5%**	**10%**	
GDP	0	-2.93	-2.065	-2.952**	Reject Ho
GE on health	0.0002	-3.95	-6.167	-2.852**	Reject Ho
GE on education	0.017	-2.25	-7.382	-3.852**	Reject Ho
GE on agriculture	0.0003	-2.32	-2.978	-2.752**	Reject Ho
GE on infrastructure	0	-2.85	-6.978	-4.752**	Reject Ho

Note:** Significant at $p<0.05$ (It specifies that asterisks are to be used to mark significance).

Based on the rule of thumb for the interpretation of the Phillips-Perron (P-P) test and the ADF test, the value was negative; and the more negative it became, the stronger the rejection of the hypothesis that there is a unit root at some level of confidence. Also, since $z(t) \leq 0.05$, this signifies that the null hypothesis (H_o) was rejected; meaning that the series has a unit root. Again, on searching for stationary, the test was performed on the other level of the first difference by employing the same test of PP and ADF testing results for government expenditure and economic growth. In this trial for the first differences, all variables were found stationary at 5% levels of significance. Therefore, these variables were integrated at order one 1(1).

4.3 Lag Test for Co-integration

The results of the lag test as seen in Table 4 reveal that the chosen maximum lag for all variables was lag one as it has the lowest FPE, AIC, HQIC, and SBIC compared to all other values at the different number of lags.

Table 4: Lag Test for all Variables

Lag	FPE	AIC	HQIC	SBIC
0	3.60E-06	-6.8698	-6.8393	-6.7854
1	4.01E-07*	-9.04176*	-8.95016*	-8.78843*
2	4.30E-07	-8.9866	-8.8340	-8.5644

4.4 Co-integration Tests

These aimed to examine the impact of government expenditure on economic growth and uncover causal relations among dependent and independent variables by determining if stochastic trends were available. The tests were used, therefore, to identify scenarios where two or more non-stationary time series are integrated in a way that they cannot deviate from equilibrium in the long-term. The tests are used to identify the degree of sensitivity of two variables to the same average price over a specified time. This approach has recently become more known in some empirical studies. Owusu-Nantwi (2015) and Kamedde (2019) also used it in their studies. This test was performed after testing stationarity to suggest the appropriate model to be adopted between error corrections models (ECM), long-run equations with least squares, and the autoregressive distributed lag model. The equations for λ trace and λ max statistics in equation (1) and equation (2), respectively, follow. Whereas λ represents the Eigen-value, T is the number of observations, while $r = 1, 2, 3\ldots n$.

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{k} log(1-\lambda_i) \qquad (1)$$

$$\lambda_{trace}(r) = -T\, log(1-\lambda_{r+1}) \qquad (2)$$

Table 5: Johansen's Test for Co-integration (Long-run Relationship)

Null Hypothesis (H_0)	Trace Statistics	5% Critical Value	Max Statistics	5% Critical Value
$r = 1$	11.1365*	15.41	9.901	14.07
$r \leq 1$	1.2355	3.76	1.2355	3.76

Note: H_0= No co-integration test

The Johansen's test for co-integration is performed with a null hypothesis that there is no co-integration equation in the model, and the hypothesis is rejected when the trace statistic and max statistic are greater than 5% critical value (Hjalmarsson & Österholm, 2007). The results in Table 5 show the trace statistics and max statistics are lower than their respective 5% critical values. Because of that, the study fails to reject the null hypothesis. Therefore, the interpretation is that there is no long-run relationship between economic growth and government expenditure.

4.5 Chow Test

In the time series data, there might be a possibility of the existence of structural breaks. A structural break is an event in a time series data that makes comparisons

before, after, and sometimes during an impossible or meaningless event. When it exists in the data, the coefficients of the model might not be constant over the full sample (Parpiev, 2016). The test was only used when there was a structural break in data at some point. The first step involved the graphing of the economic growth variable (GDP) to observe its behaviour over time. Figure 2 shows the graph that reveals GDP might have had a break in 2002. This enabled the creation of a dummy variable for the year before 2002 to be 0, and after to be 1. Further, an interaction variable for the dummy to each independent variable was also created.

Table 6: Chow Test Results

Variable	F (2, 41)	Prof > F
Health Expenditure	0.16	0.8565
Education Expenditure	2.10	0.1357
Infrastructure Expenditure	5.54	0.0074
Agriculture Expenditure	0.12	0.8859

Source: STATA Analysis Output (2022)

From the results in Table 6, the infrastructure expenditure variable has a structural break, that is, its coefficient changes between two periods of time (before and after 2002). This is because the *p*-value was less than 0.05, leading to the rejection of the null hypothesis, which states that since the two periods do not share the same intercept and coefficient, they have different coefficients. Also, for expenditure variables related to health, education, and agriculture, the *p*-values indicate the failure to reject the null hypothesis. Therefore, the two periods of time share the same coefficient and intercept.

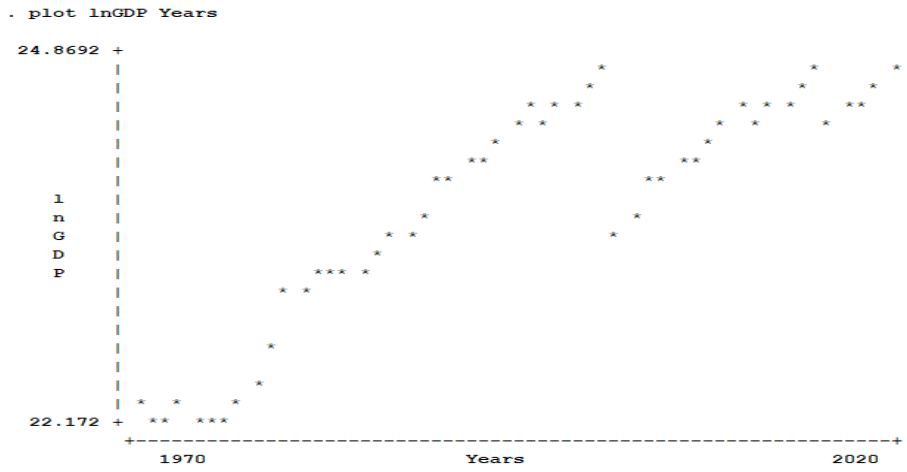

Figure 2: The Structural Break of GDP
Source: STATA Analysis Output (2022)

4.6 Autoregressive Distributed Lag (ARDL) Model

The autoregressive distributed lag model was further used to assess the impact of government expenditure on economic growth in Tanzania as illustrated in Table 7. According to Carter et al. (2011), the procedure for a unit root test is only to test the short-run ARDL model for using first difference data if the data were not co-integrated.

Table 7: ARDL Short Run Estimates for GDP

Economic growth	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
GE in Health	-0.025	0.002	-12.33	0.007	-0.341	-0.165	**
GE in Education	-1.635	0.064	-25.20	0.02	-1.914	-1.356	**
GE in Agriculture	-1.720	0.047	-35.93	0.001	-1.926	-1.514	***
GE in Infrastructure	-0.893	0.038	-23.43	0.002	-1.057	0.729	***
Constant	3.907	0.160	24.41	0.002	0.996	4.5965	***
Mean dependent var	10.200		SD dependent var		8.381		
R-squared	0.7647		Number of obs.		50.00		
F-Value	3.485		Prob > F		0.013		
Akaike crit. (AIC)	730.820		Bayesian crit. (BIC)		437.312		

Note: *** p<.01, ** p<.05, * p<.1

The results presented in Table 7 indicate that the model used significantly (p-value <0.01) accounts for the variation between the independent variable and the dependent variables. The R^2 value 0.7647 of the variables means that the independent variables were able to explain the variations in economic growth by 76.47 percent.

5. Discussions of Findings

5.1 Expenditure on Health Sector and Economic Growth

The study intended to determine the effect of government expenditure on the health sector and economic growth in Tanzania. The first objective assumed that less government expenditure on health has higher economic growth, taking the benefit of GDP. Since the t-statistics were above 1.96, as per the rule of thumb the result signifies that health expenditure is significant in explaining economic growth in Tanzania. The finding is in line with several previous studies that have found it to positively and significantly influence economic growth (Ndaguba & Hlotywa, 2021; Raghupathi & Raghupathi, 2020). Again, this finding was coined by Mosha et al. (2021), whose results revealed that the insignificant long-term coefficient of government health expenditure on economic growth should not necessarily be taken as a reason to reallocate health expenditure from the health sector (ibid.). They recommend that for Tanzania to sustain its economic growth, it needs to pay attention to measures that would improve the health of its citizens through allocating adequate budgetary expenditure to the health sector.

5.2 Expenditure on Hard Infrastructure and Economic Growth

The study has found a positive but non-significant effect of infrastructure expenditure on economic growth. The previous literature is contradicted by this result as Babatunde (2018) found a negative effect in Nigeria, while others found a positive effect (Azolibe et al., 2020; Kamedde, 2019; Chijioke & Amadi, 2020). The findings from this study concur with the benefit theory, which argues that a country with comparatively safe government expenditure on infrastructure will be less exposed to problems in economic growth. Based on the regression results, whereby the t-statistic was -23.43 and above 1.96, this signifies that expenditure on hard infrastructure has a significant impact on economic growth in Tanzania.

The same results were also revealed by Ismail and Mahyideen (2015), who demonstrated that improvements in transport infrastructure—such as road density network, air transport, railways, ports, and logistics—have resulted in increased trade flows. On the other hand, they commented that the soft infrastructure, and particularly the information and communications technology (ICT) infrastructure, has also enhanced trade, as the numbers of telephone lines, mobile phones, broadband access, internet users, and secure internet servers were found to have positive trade effects for both exporters and importers in Asia. These results aligned with some results from different scholars such as Magazzino et al. (2015), Lulu and Lei (2019), Chude and Chude (2013), whose studies concluded that government expenditure on hard infrastructure is a stimulus to the economic growth of a country.

5.3 Expenditure on Education Sector and Economic Growth

Both predictor variables of government expenditure in education and the lag of government expenditure in education were statistically significant in influencing GDP in Tanzania. Since the t-statistic value was -25.20 and above 1.96, this suggests that the independent variable (government expenditure) influences the dependent variable (economic growth). This implies that government expenditure on education improves human capital in Tanzania, and leads to the enhancement of economic growth. This finding corresponds with those of Salim (2017), and Pierra and Aziza (2017). Furthermore, the finding also matches with those of Amaghionyeodiwe (2018); Owusu-Nantwi (2015) and Mekdad et al. (2014), whose results reveal that expenditure on education has the highest impact on the economic growth of a country; and suggested the increase of more investments in the education sector. However, Bexheti and Mustafi (2015) found a negative effect, and Suwandaru et al. (2021) found the lack of an effect at all; contradicting the current results.

5.4 Expenditure on Agriculture Sector and Economic Growth

Based on the regression result of a *p*-value of 0.002, this tells whether there is a statistically significant relationship between each predictor variable and the response variable. Since the p-value was < 0.05, the null hypothesis was rejected; meaning that government expenditure on agriculture has a significant impact on economic growth. This could further support the call for African states, under the

Maputo Declaration, to allocate at least 10% of their government budgets to agriculture to promote enhanced execution of national agricultural investments expressed along the lines of the comprehensive African agricultural development program (Kira, 2017; Gamini Bandara & Weerasooriya, 2019). This finding is in line with previous studies: that government expenditure on agriculture promotes economic growth (Ngobeni & Muchopa, 2022; Oyibo et al., 2013). However, some studies have shown a negative effect (Chijioke & Amadi, 2020; Lian & Seng, 2020). In the debate, this study has added the perspective from the Tanzanian experience and context: that public spending in agriculture leads to positive growth outcomes. Therefore, this indicates that government expenditure on agriculture is important in the development of the economy. In the same vein, Gupta et al. (2019) concluded that economic growth is positively related and dependent on agriculture, implying that the higher the investment in agriculture, the higher the economic growth.

6. Conclusion and Recommendation

In the long-run, expenditure on hard infrastructure, education, health, and agricultural projects have positive effects on economic growth. The government should play an important function in formalizing the model of economic growth through government expenditure reforms. Further, the government should find out how much of an economy's funds should be invested, redirected, used, and distributed to enhance economic growth. Hence, the findings of this study highlight the fact that government expenditure on infrastructure, agriculture, education, and health is imperative in enhancing economic growth as maintained by Zouhar et al. (2021) and D'Agostino et al. (2016). To boost the growth rate of the economy, the government must opt for severe controls on its expenditure in these sectors to decrease deception, financial distraction, and misconduct. Furthermore, monitoring and assessment of government expenditure must be given top concern to ensure that the targets of government expenditure are attained.

The study, therefore, recommends that the government should increase the expenditure on substantial infrastructures such as water facilities, airports, roads, electricity, railways, and communication because they contribute extensively to economic growth by enhancing efficiency in the public and private sectors. Moreover, the spending on the construction of hospitals, dispensaries, schools, and buying laboratory equipment extensively contributes to economic growth by promoting efficiency in the public and private sectors. Generally, the study recommends the government prioritize its expenditures: it should increase its expenditure in areas that are useful to the private sector, and avoid those sectors that compete with or crowd it out.

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Appendices

Table A1: Multicollinearity Test

```
. correlate educ01 bmi01 mage2 religion3 childsex res hv237 alcohol birthint premature single power sanitation visi
> ts h_insurance
(obs=2,717)
```

	educ01	bmi01	mage2	religi~3	childsex	res	hv237	alcohol	birthint	premat~e	single
educ01	1.0000										
bmi01	0.0292	1.0000									
mage2	0.0077	0.0149	1.0000								
religion3	0.2119	0.0159	-0.0165	1.0000							
childsex	0.0025	-0.0184	-0.0026	0.0309	1.0000						
res	-0.2173	-0.0761	-0.0324	-0.2864	-0.0321	1.0000					
hv237	-0.0733	0.0106	-0.0175	-0.0136	-0.0029	0.0139	1.0000				
alcohol	-0.0793	-0.0315	-0.0326	-0.1235	0.0404	0.1384	0.0007	1.0000			
birthint	0.0085	0.0211	-0.0773	0.0457	-0.0198	0.0140	0.0197	0.0215	1.0000		
premature	0.0078	0.0207	0.0073	-0.0149	-0.0473	0.0429	0.0280	0.0069	-0.0185	1.0000	
single	-0.0026	0.0163	-0.0069	0.0202	0.0236	-0.0153	-0.0169	0.0180	0.0024	-0.2224	1.0000
power	-0.2823	-0.0714	-0.0316	-0.2860	-0.0532	0.6561	0.0367	0.1379	-0.0062	0.0303	-0.0146
sanitation	-0.1780	-0.0326	0.0048	-0.1860	-0.0065	0.4813	0.0677	0.0867	-0.0427	-0.0170	0.0031
visits	-0.1693	-0.0180	0.0361	-0.1109	0.0127	0.0575	0.0586	0.0285	-0.0945	-0.0036	0.0190
h_insurance	-0.4639	-0.0447	0.0120	-0.2361	-0.0125	0.2926	0.0637	0.0925	-0.0438	-0.0116	-0.0225

	power	sanita~n	visits	h_insu~e
power	1.0000			
sanitation	0.4253	1.0000		
visits	0.1161	0.0797	1.0000	
h_insurance	0.3886	0.2124	0.1856	1.0000

Table A2: Parallel Regression Assumption Test

```
. brant

Brant test of parallel regression assumption

             |       chi2     p>chi2      df
-------------+--------------------------------
         All |      11.86      0.457      12
-------------+--------------------------------
      educ01 |       0.45      0.504       1
       bmi01 |       0.42      0.519       1
       mage2 |       0.63      0.429       1
    religion3 |       0.56      0.454       1
      single |       1.31      0.253       1
    childsex |       0.19      0.661       1
         res |       0.05      0.820       1
       hv237 |       2.13      0.144       1
    birthint |       1.60      0.206       1
   premature |       0.32      0.569       1
       power |       1.70      0.192       1
  sanitation |       0.05      0.817       1

A significant test statistic provides evidence that the parallel
regression assumption has been violated.
```