International Journal of Econometrics and Financial Management, 2018, Vol. 6, No. 1, 7-16
Available online at http://pubs.sciepub.com/ijefm/6/1/2

DOI:10.12691/ijefm-6-1-2

Economic Growth and Public Spending on Selected Sectors in Tanzania

Alfred James Kimea[1,*], Richard Fue Kiangi[2]

[1]Institute of Tax Administration, Tanzania
[2]Institute of Finance Management, Tanzania
*Corresponding author: akimea@tra.go.tz

Abstract This paper presents empirical analysis of the relationship between sectoral public expenditure and economic growth in Tanzania. It uses time series data spanning over the period from 1968 - 2011. In this paper real gross domestic product (GDP) is used as a proxy of economic growth. The investigation focuses on analysis of relationship between public expenditure on education, agriculture, transport and communication and the rest of the sectors (ROS) and economic growth. Augmented Dicker-Fuller, Phillips-Perron, Johansen co-integration test and vector error correction model are used to capture short and long-run dynamics of economic growth. Our result indicates that public expenditure plays no significant role in accelerating economic growth in Tanzania for the last 44 years. These finding may give some overview of policy implications to the Tanzania policymakers on optimizing the effects of government expenditure in economic growth.

Keywords: *public expenditure, economic growth, Tanzania*

Cite This Article: Kimea, A.J, and Kiangi, R.F., "Economic Growth and Public Spending on Selected Sectors in Tanzania." *International Journal of Econometrics and Financial Management*, vol. 6, no. 1 (2018): 7-16. doi: 10.12691/ijefm-6-1-2.

1. Introduction

Policy makers in both developing and developed countries are divided as to whether increased public expenditure promotes or hinders economic growth. There are those, who support greater and those who support minimal public expenditure. Those, who support greater public expenditure, argue that public spending is important in the provision of valuable public goods such as defense, administration of law, order and justice, infrastructure, education, health and other social services. They also argue that fiscal policy in general and public expenditure in particular is an important tool for boosting sustainable economic growth. Aggregate public expenditure promotes aggregate demand [1]. Public expenditure has traditionally been a component of fiscal policy which is an instrument of the State to influence the economic growth [2]. There is evidence to support the thesis that public spending affects economic growth positively. This is similar to what was propounded by the Keynesian model which postulates that economic growth is strongly affected by the increase in the size and composition of public expenditure. But, the proponents of smaller public spending have an opposite view. They argue that high level of public spending leads to the transfer of resources from private hands who invest in productive sectors to the government through various taxes. Government cannot be as careful in spending public money as the people are. Obviously transfer of resources from more to less productive or wasteful use adversely affects the growth of GDP. This affects growth of the economy adversely by reducing multiplier and accelerator effects of private consumption and investment respectively in which the government utilizes resources inefficiently. In their opinion public expenditure and its functional composition has a negative impact on growth of the national output [3]. It is implicitly assumed that all investment by the government is always in less productive lines of production and/or less efficient public enterprises. As against this, private investment is always in more productive lines and allocated resources are always inefficiently used. But, in developing economies, many private enterprises may be as inefficient and less productive as government enterprises due to protected markets.

The most influential and earliest analyst among other classicists on the roles and functions of the government was Adam Smith. Smith, Adam, [4], in his book titled 'An Essay on the Nature of and Causes of the Wealth of Nations'. In this book he advocated the philosophy of '*laissez faire*' in which he argued that the economy of any state can work best if it is left to function on its own without government intervention in terms of restrictions and regulations on economic affairs. Adam Smith opined that the state should limit itself to three major activities; i) defense against foreign aggression, ii) administration of justice and maintenance of internal law and order, iii) promoting development of public works. In other words, the government should protect its citizens against internal and external aggression and supply public and merit goods, which the market cannot provide to the society. Any other role and function, which were beyond the scope of the government and its expenditure, were deemed inefficient and uneconomical. Underlying thought was

that (i) individual interests are pursued best by individuals; and (ii) if each individual maximizes his/her interest, social interest is also maximized. Thus conflict between i) one and other individual's interest, and ii) individual and social interest was overlooked. Unbridled pursuit of profit at any cost by capitalist producers ended up in (i) division of society into haves and have-nots, and (ii) though capitalists rolled in prosperity, yet working classes lived in a state of misery, squalor, deprivation and even immesirisation. This created wide spread anger and opposition against the laissez faire philosophy by social leaders, thinkers and philosophers.

The new philosophy and political theory then emerged; the concept of ruling state was replaced by the welfare state where government/state has to protect and promote wellbeing of the people. Consequently, there has been substantial increase in the roles and functions of state and this resulted in an increased roles and functions of the state in various countries. Pigou [5], the author of '*Economics of Welfare*' initiated the study of public expenditure on social welfare. Among other scholars, who have popularly explained the role of state in the economy, Wagner's Law and Keynesian Hypothesis are important. Wagner's Law states the tendency of bureaucracy to spread its wings as a consequence of which public expenditure increases continually. Keynes advocated government intervention to propel effective demand by public expenditure. Public intervention was supposed to fill up the gap in demand left by the market operation.

Wagner, A. [6] assumed the "tendency of expansion of public in general and state activities in particularly'' suggested that greater public spending is important for promoting economic growth. The law states that "as the economy develops over time, the activities and functions of the government increase". Private expenditure on (i) health, (ii) education, and (iii) irrigation, depends on public expenditure. Besides, increase in public expenditure on economic infrastructure like roads, aviation, banking and insurance also stimulates private expenditure on such items [7]**.** Keynesian Hypothesis states that public expenditure overcomes the constraining influence of inadequacy of market based effective demand; it paves the way for active public policy and decisive role of the government in economic affairs of the countries. Unlike Adam Smith, this theory was one of the earliest attempts that emphasizes public sector growth as determinant of economic growth. One major criticism of Wagner's work is that he does not specify whether he refers to the growth of (i) absolute public expenditure, or (ii) public expenditure relative to GDP, or (iii) public sector relative to the size of the economy [8]. However, Musgrave [9] interpreted Wagner's law as relating to the size of public sector relative to the size of the economy.

Devarajan, S. and Swaroop, V., [10] used a sample of 14 OECD countries. Their findings revealed the positive impact of public expenditure on social and economic infrastructure. Above all, they noted that public expenditure on education and defence has harmful effect on growth. However, inter-relations between income and expenditure on education are characterized by lead-lag structure; if these facets are not incorporated in the analysis of data, results shall be awry like the ones reported above [8,11]. Besides, one inference may easily be drawn from the above discussion and it is that both magnitude and composition/structure of public expenditure are important facets in its inter-face with economic growth. Though numerous studies of aggregate public expenditure have been conducted, yet only a few studies are based on the analysis of particular country, which focus on public expenditure on key sectors of the economy.

Lin, S [12] revealed that government expenditure on non-productive activities play significant role in developing economies. This study also furnishes rationale for treating public spending be of paramount importance in developing countries. Vedder and Gallaway, [13] lend support for the findings of Lin and they showed the reasons that make government expenditure the major determinant of economic growth in developing countries. It was inferred that given their high levels of public debt, an increase in public expenditure may not have its intended beneficial effect in developing countries. It was also argued that public spending promotes growth by enhancing the capital stock, advances in technology, and improvement in quality of human resources and literacy (For inter-relation between Literacy and Growth [14,15]). The role of government and its public expenditure in developing countries has a strong bearing in correcting market failures and promoting economic growth through fiscal policies (which include taxation and public expenditure). Fiscal instruments have proved more effective in stimulating growth in many developing countries than the monetary instruments; reason is that most of these countries still continue to have predominantly non-monetized segments in the economy. Inadequate capital base, low per capita income not being the base for capital accumulation by households, poor infrastructure and non-availability of entrepreneurs in adequate numbers [7]. Gupta et al. [16] also provided empirical evidence to support the view that fiscal policy plays a significant role in catalyzing growth and development of developing countries like Tanzania. This is why the issue of the relationship between public spending and growth has continued to remain in of researchers, policy makers, activists and academicians.

Commenting on the role of public spending on economic growth Jaroensathapornkul, J. [17] argued that public spending significantly affects economic growth positively. This study focused on three main development sectors of the economy of Thailand, i.e. education, economic service and defence. These sectors which are analysed in this study are indeed important to economic growth although agriculture, transport and communication and education are more important for the case of Tanzanian economy. So, this study has included them in the analysis.

In contrast to the views discussed above, the neo-classicists consider fiscal policies including public expenditure fruitless since public expenditure reduces private investment in sectors like education, health, agriculture, transport and communication through the so called "crowding-out". For example, Diamond, [18] explained that crowding-out of private investment is due to budget deficits and its effect on interest rates. This is similar to the arguments of the neoclassical economists that increased public spending can affect the economy by shifting resources from the private sector to the government sector. This creates negative effect on the private sector and consequently on economic growth.

This study is different from earlier studies in several respects, especially in theoretical thrust and methodological advancement. This study considers aggregate public expenditure along with public expenditure on agriculture, transport and communication and education as the most important sectors that are not related directly to public expenditure but with growth of these sectors paves the way for growth of the economy as a whole. Recent studies Kweka & Morrisey, [19] did not include public expenditure on agriculture in the growth model. Tanzania as one of the developing countries is currently experiencing increased public expenditure that seems to be not associated with significant growth in total output. Keeping various studies in view and theories related to the roles and functions of public expenditure it is important to carry out an empirical study to investigate whether public expenditure on these key sectors of Tanzanian economy has positive or negative impact on economic growth. As observed above, various studies have shown contradictory findings in relation to the impact of public expenditure on economic growth. There is only one study which found direct relationship with the current study for the case of Tanzania [19]. However, Kweka and Morrissey did not focus on the key economic sectors of Tanzanian economy such as agriculture which contributes over 85 percent to Tanzania total exports. This sector accounts for more than 24.5 percent of GDP and employs about 80% of the work force. But the findings of this study are contradictory. This research investigation is focused on addressing the question as to whether aggregate public expenditure along with sectoral expenditure on three key sectors of the Tanzanian economy including agriculture, education and transport and communication affects economic growth; this is what differentiates the scope of present study from the earlier studies. Time period covered and evaluation of impact of globalization on growth and its comparison are other distinguishing features of this thesis.

2. Literature Review

2.1. Overview Trend of Government Expenditure in Tanzania

Government expenditure is a term used to describe money that a government spends, including all government consumption and investment or it can be defined as "the dispensation by the state (government), on non-market criteria, of economic resources" that it has acquired from taxpayers and other public sources of finance [20]. Expenditure occurs on every level of government, from local councils to central organizations. There are several different types of government expenditure, including the purchase and provision of goods and services, investments, and money transfers.

One form of government expenditure is akin to investing, though formally referred to as gross fixed capital formation. This involves the creation and support of systems and institutions that are seen as assets to the producing value of the country. The building of new road systems, bridges and airports are also major areas of this type of spending.

Since independence, the government of Tanzania has been financing different projects and activities to fight against three enemies of development which are ignorance, poverty and diseases. Thus the government has been incurring some costs when implementing policies which it has been trying to establish and other existing policies to which is trying to make some changes so as to fight against the development problems.

Recurrent and development expenditures constitute main components of government expenditure. Recurrent expenditure is used to finance daily activities of the government, for example, salaries for its employees and, over twenty years, recurrent expenditure has taken a larger share which is more than sixty percent while development expenditure which is used to finance development projects such as construction of roads, railway lines, takes a small share which is less than forty percent [20]. Government spending on some sectors has been reduced, for example agricultural subsidies, where the emphasis is given to the private sector as proposed by SAPs conditionality. Furthermore, Government expenditure is further subdivided into Ministerial, Regional and Local Government expenditure [21].

The government expenditure of Tanzania has been increasing yearly due to the increase in the activities that are financed by the government. For example, the government expenditure has been rising in an attempt to alleviate poverty since the onset of the Poverty Reduction Strategy Programme (PRSP), the policy established at the end of 1990s specifically as a special programme for poverty alleviation. This led to the high increase on government spending from Tsh 444.8 billion in 1995 to Tsh 2,993.8 billion in 2004 [22] also the total government expenditure increased from Tsh 326 billion in 1986 to Tsh 602 billion in 1999 (all measured in 1995 constant prices) and the Government spending of a given year is determined by the national budget of each year.

The share of spending on social services in total government expenditure grew from 14 percent in 1986 to 25 percent in 1999 while the spending on economic services increased from Tsh 64 billion in 1986 to Tsh 135 billion in 1995 before falling to Tsh 36 billion in 1996. Until 1999 spending on economic services was Tsh 128 billion [23]. Also the high spending had been noted during the Arusha declaration era from 1967 due to increased provision of social services on equal basis and thus freely to all people. Furthermore, the high spending was noted in the 1970s due to nationalization (1971) and decentralization (1972) policies. This led to high government expenditure due to expansion of the government administrative machinery and staffing [24].

Furthermore, the oil price shocks of 1973/74 and 1978 led to an increase in import bill which resulted into the increase in government spending, while in 1974/75 there was high government spending due to the drought that led to importation of food stuffs. Lastly the breakup of the former East Africa Community (EAC) in 1977 led to the use of resources to develop infrastructure while Kagera war of 1978/79 also led to increase of the government expenditure [25].

The government spending on general public services including administration was continuously rising in the period 1970–1990, while in 2011 it was 39.0 percent. Similarly, government spending on public debt grew rapidly, increasing from about 7 percent of total spending

in 1970 to about 30 percent in 1990 and then to 30.9 percent in 2001, while in 2011 it was 15.3 percent. This increase in government expenditure on general public services and public debt was at the expense of a decline in public spending on social services as well as economic services, which implies also that while expenditure on education and health has been indicating a significant decrease, debt servicing has been increasing over time from 6.8 percent in 1970 to 11.6 percent in 1980 and then to 29.8 percent in 1990 before rising to 30.9 percent in 2001.

During 1970s, the trend of government expenditure in education sector differs from that of 1980s to 1990s. Government expenditure in education gradually declined from 13.6 percent in 1970 to 12.0 percent in 1980, slowing down to 6.9 percent in 1990 before rising to 16.1 percent in 2001. Also the spending declined to 9.1 percent and 6 percent in 2008 and 2011 respectively [26]. Lately the government has been implementing two education policies, namely Primary Education Development Program (PEDP) and Secondary Education Development program (SEDP), that aimed to increase the numbers of schools and teachers.

Meanwhile the health sector was also affected due to the economic crisis of 1980s which resulted into the decrease in government expenditure, for example health budget of 1982/83 was only 57 percent in real terms of that of 1977/78 [27]. There was a decline in government expenditure on health services from 5.4 percent in 1970 to 4.9 percent in 1990, but later on rose from 3.7 percent in 1995 to 6.7 percent in 2001 and then increased to 5.4 percent in 2011. The increase in government spending between 2000 and 2011 was due to the health policy which required rehabilitation and extension of the existing health centers. In addition, building of the health centers in each village has contributed much to the increase in government expenditure within the period [26].

By 1970 government expenditure on defense was 7.1 percent while by 1980 government expenditure on defense had increased to 11.1 percent but dropped to 6.2 percent in 1990 before rising to 7.9 percent in 2001 [21]. Recently government expenditure on defense declined to 5.2 percent in 2011 [28].

Government expenditure on economic services declined from about 38 percent in 1970 to about 16 percent in 1989 and then rose from about 22.1 percent in 1990 to 22.5 percent in 2001. The decline in government spending on economic services led to their poor provision possibly affecting production and the overall performance of the economy [20], yet in 2011 the economic services received 7.7 percent of the total budget [28].

Finally, government expenditure on the other charges varied from 4 percent in 1980 to 6.7 percent in 1990 while in 2001 it was 0.9 percent before increasing to 15.9 percent in 2011. The reasons for all these variations in government spending in the period (1970-2011) were prompted by changes in government priorities and conditionalities from donors such as International Monetary Fund (IMF) and World Bank (WB).

2.2. Government Expenditure on Education

Education has a significant role in the development of countries. It is widely acknowledged as an important determinant factor of economic growth. Education fulfils function in providing qualitative and quantitative labour required in the development process, while on the other hand, with its production and dissemination of knowledge function, it encourages countries to follow and develop modern manufacturing technologies and to transfer them to the production process. The increase in labor productivity as the level of education increases affects the competitiveness of countries positively and facilitates openness. Differences in education level are one of the main reasons of economic performance differences between developed and developing countries.

The fact that education has important effects on economic growth today is accepted beyond argument. The studies to display the effect of education and education expenses on growth are highly important in Economics theory. There is a wide range of literature on this issue, on this backdrop, some studies [29,30,31,32,33] argue that there is a direct effect of investments in education on economic growth. On other hands, some studies [34,35,36,37,38] argue contradictory results of the impacts of investment in education on economic growth. Cullison [39] and Barro and Salai-Martin [40] found a positive relationship between government investment in education and economic growth, but Levin and Renelt [41] found that the government spending is not necessarily correlated with economic growth. Solow [42] revealed that capital, labour, and technology can not only be the ingredients of economic growth. Education is also one of the prime factors to push economic growth as well. The impact of education on economic growth was emphasized by one of the pioneer economists [43]. He investigated that there was a tremendous importance of education on economic growth of a nation. Lucas [44] elucidated an endogenous growth model which further explained human capital as one of the prime factors of economic growth. Human capital accumulation is possible through the expansion of education Lucas [44] .It has a positive impact on labour productivity. Labour having more educational qualification can be engaged in skilled works which envisage the economic growth and nation building. Barro [45] demonstrated that economic growth and education are positively related. The relationship between human capital and economic development approach has been extensively examined [45,46,47] and it demonstrates that economic growth and education are positively related to each other.

Study conducted by Ese Urhie [48] in Nigeria which examined the effects of the components of public education expenditure on both education attainment and economic growth from 1970 to 2010 by using Instrumental Variable Two Stage Least Squares estimation technique reveals that public education expenditure has both direct and indirect effects on economic growth. Contrary I.R. Irughe [49] found negative effect of government education expenditure on economic growth in his study for period from 1977-2009 using the error correction modeling technique and a geometric method of analyses.

According to Muktadir-Al-Mukit [50] Education is an important determinant of economic growth for any country. In his study which investigated the long-run relationship between public expenditure on education sector and economic growth in Bangladesh found that public spending in education has a positive and significant impact on economic growth in the long run. In this study

an econometric model is applied to the analysis with time series data from 1995-2009.

The study conducted in Malaysia by Mohd Yahya Mohd Hussin [51] which focuses on the long-run relationship and causality between government expenditure in education and economic growth by using time series data for the period 1970 to 2010 found that economic growth positively affected by government expenditure on education

Study by Mekdad at el [52] which seek to study the relationship between education and economic growth in Algeria over the period 1974-2012 using endogenous growth model suggested that Public spending on education affects positively economic growth in Algeria. Douanla Tayo Lionel [53] used vector error correction model to assess the effect of government spending in education on economic growth in Cameroon over the period 1980-2012. Study found that the education spending is one of the main driving force of the economic growth process in Cameroon.

Expenditure on education requires a little more discussion because some economists hypothesized that expenditure on education is financed out of current income (Komorov, cited in [7]). But the majority of economists opined that expenditure on education, among other factors, determined the growth of income. Economists like Bowen hold the view that education-economy are bi-directionally related. The debate was resolved by S. Prakash [7,11] who opined that relation between education economy have lead-lag structure. Current expenditure is, financed from current income. But expenditure on education incurred in the past for accumulating human capital determines current income both at national and households' level. This analysis also involves (i) testing the properties of time series data by the application of Augmented Dickey-Fuller test, and (ii) testing the short-run and long-run relationship between the variables by the application of Johansen and Juselius model of co-integration and vector error correction.

Based on the above literatures from previous studies this paper would investigate the influence of the public expenditure on Tanzania economic growth. Hence, the following hypotheses were formulated.

Hi: Higher level of public expenditure on education is associated with accelerated growth of output/income.

2.3. Public Expenditure on Agriculture

For many developing countries, agriculture is the largest sector in terms of its share in GDP and employment. More importantly, the majority of the world's poor live in rural areas and depend upon agriculture for their livelihood. Agriculture is therefore critical both for economic development and poverty reduction. It follows that in developing countries spending to agriculture is one of the most important government instruments for promoting economic growth and alleviating poverty in rural areas [54]. There have been many studies of the relationship between government expenditure and economic growth. Some of these studies have looked specifically at the link between government spending and agricultural growth [55]. These studies show positive growth effects from public spending in agriculture. Yet, in the majority of developing countries aid and public expenditure to agriculture is stagnant or declining. Therefore, this study examines the significance and the contribution of the government expenditure on agriculture on Tanzania economic growth. The following hypothesis developed.

Hii: There is a significant positive contribution of public expenditure to agriculture on economic growth of Tanzania.

2.4. Public Expenditure on Infrastructures

The infrastructure development such as transports and communications are the central to a county growth and development. Therefore, nations are striving to enhance quantity and quality of available infrastructure and their accessibility. Among other things, the availability of infrastructures such as road, airports, railways, telecommunications have significant effect on the quality of life of people in a given environment. The macroeconomic availability of infrastructure services affects the marginal productivity of private capital. In the context of microeconomics, infrastructure services influence reductions in production costs [56]. Infrastructure also influences quality of life and well-being, affecting, among other things, consumption levels, labour productivity access to employment, levels of real wealth, macroeconomic stability, fiscal sustainability, the development of credit markets, and other aspects of labor markets.

The impact of infrastructure on long-run economic growth has been studied extensively. The basic theoretical framework of the impact of public capital on economic growth was developed first by Arrow and Kurz [56]. Based on this framework, the endogenous growth literature shows that an increase in the stock of public capital can raise the steady state growth rate of output per capita, with permanent growth effects [57]. Other studies focus on the differential impact of capital and current components of public spending on growth [58], showing a positive effect from capital expenditures and often negative effects from current or consumption expenditures.

Calderon and Serven [59] analyze the impact of infrastructure on economic performance of African countries. Using panel data for a large sample of countries for the period 1960-2005, they employ growth regressions estimated through a Generalized Method of Moments estimator and evaluate the impact of several types of infrastructure assets, as well as measures of quality of their services. Their findings suggest that both infrastructure stock and quality are positively and significantly related to real GDP per capita growth. In addition, the latter study evaluates the impact of a higher infrastructure development in African countries over the last 15 years (comparing 2001-05 to 1991-1995).

Finally, infrastructure also affects economic performance through an indirect channel related to income distribution. Higher access to infrastructure services often helps reduce income inequality by lowering logistics costs or raising the value of human capital or land [60,61,62]. This study investigated the important of public expenditure on infastractures such as transport and communication on economic growth. The following hypothesis was developed

Hiii: Public expenditure on transport and communication has a positive impact on the growth of the economy of Tanzania.

3. Methodology

This study uses data related to Real GDP as a proxy of economic growth, Government expenditure on agriculture, education and transport and communication as part of public expenditure. The data used are time series of 44 years spanning over the period from 1968 to 2011. The data were collected from the Ministry of Finance and Empowerment and Tanzania National Bureau of Statistics. All the series are at constant prices and 2001 is the base year. The study focuses on only three individual sectors because latest available data for other sectors are from 2002/03 to 2010/2011. This reason has limited the scope of this study to three sectors along with aggregate public expenditure.

4. Empirical Findings

4.1. Unit Root Test

The study uses time series data. In order to avoid spurious regression results, it is important to examine the order of integration of each series. The study makes use of alternative tests, Augmented Dickey Fuller (ADF) and Phillips-Perron unit root tests to supplement each other. The tests are applied at level and first difference to observe if the variables are stationary. All variables used are in natural logarithm. Table 1. depicts computed ADF test statistics which are compared with the critical values from MacKinnon [63]. The absolute critical values are 3.580 and 2.930 when the test includes intercept and no deterministic trend at 1 and 5 percent probability respectively. But, if the test includes both constant and trend the critical values in absolute are 4.150 and 3.500 at 1 and 5 percent probability level respectively. The results of this test, reported below indicate existence of unit root at level. This means that the series are non-stationary at level and therefore the series have to be subjected to the test of first differences. The results for both ADF and PP tests based on first differences reject the null hypothesis of a unit root for all variables at 1% level of significance except for real GDP, for which it is rejected at 5% significance level. This is because the computed absolute t-statistics reported in the table are greater than the absolute calculated values. All five series are integrated of same order, i.e. I(1).

Table 1. Augmented Dickey-Fuller and Phillips-Perron Tests

	Augmented Dickey-Fuller		Phillips-Perron	
	Level	First Difference	Level	First Difference
lnGDP	1.5700	-3.8165**	0.5657	-3.8598**
lnED	-2.8099	-6.4158*	-2.8099	-6.3936*
lnAG	-1.4454	-7.0385*	-1.3066	-7.1235*
lnTC	-2.9413	-7.3368*	-2.8435	-7.1513*
lnROS	-0.3308	-6.9560*	-1.8272	-8.8591*

Notes: Lag length is based on automatic Schwarz Information criterion, *(**) denotes rejection of the null hypothesis at 1% (5%) level of significance and ADF test is with constant, and constant and linear trend.

Source: Own Compilation

ln represents natural logarithm, GDP= Gross Domestic Product, ED=Education, AG= Agriculture, TC=Transport and communication and ROS=Rest of the Sectors.

4.2. Optimal Lag Length Selection Criteria

After determining that all series are stationary at the same order I(1), Johansen test can be used to examine the long-run equilibrium relationship between these series. Johansen test of co-integration requires determining optimal length of lag as one of the important criteria of analysing long-run dynamics of the five variables. Table 2 reports the optimal lag length of the Vector Autoregressive model (VAR) with five endogenous variables. Five different selection criteria are used for the selection of the optimal length of lags to be used in the study. All selection criteria suggest one lag.

Table 2. VAR Lag Order Selection Criteria

Endogenous variables: LNGDP, LNED, LNAG, LNTC, LNRPE					
Lag	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	NA	0.00011	5.0702	5.2771	5.1461
1	308.3170*	6.94e-08*	-2.3036*	-1.0624*	-1.8487*
2	24.0944	1.11e-07	-1.8904	0.3851	-1.0563

Note: * represents lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, and HQ: Hannan-Quinn information criterion.

Source: Own Compilation.

4.3. Testing for Co-Integration Using Johansen Approach

The study applies Johansen co-integration approach to examine long-run relationship between real GDP, expenditure on education (ED), agriculture (AG), transport and communication (TC) and rest of the sectors (ROS). The null hypothesis for the test is no co-integration ($r = 0$) along with the alternative hypothesis of co-integration ($r > 1$). In all the systems it is assumed that there is a deterministic trend. However, Johansen test of co-integration is carried out on condition of the null hypothesis for a unit root. This implies that, all series must be integrated of the same order. Principally, the test applies maximum Eigen-value ($\lambda_{\max}$) and trace statistics (λ_{trac}) and the results are reported in Table 3.

Table 3. Johansen Test for Co-integration

Hypothesized No. Of CE		Intercept (No trend in Co-integrating Equations)			
		Trace	0.05 Critical value	Max-Eigen	0.05 Critical value
H_0: r=0	H_1: r>0	71.6648	69.8189*	32.9508	33.8769
H_0: r≤1	H_1: r>1	38.7130	47.8561	18.7044	27.5843
H_0: r≤2	H_1: r>2	20.0096	29.7971	13.3572	21.1316
H_0: r≤3	H_1: r>3	6.6524	15.4947	5.53424	14.2646
H_0: r≤4	H_1: r>4	1.1182	3.8415	1.1182	3.8415

Note: * denotes rejection of the hypothesis at the 0.05 level. While the Trace test indicates one co-integrating vector, the Maximum-Eigen value test indicates no co-integrating vectors among the variables.

Source: Own Compilation.

The results confirm that the null hypothesis of no co-integration between growth of real GDP, expenditure

on transport and communication, education and agriculture is rejected at 5% significance level for statistics of trace. In other words, test of trace reveals that, the five variables are co-integrated or moving together in the long-run. However, maximum Eigen-value test depicts no-integrating vectors. Table 3 above indicates the existence of at least one co-integrated equation meaning that all the four variables have a long-run associationship or they move together in the long-run.

As indicated above, there is only one co-integrating equation. It entails that the number of variables (i=5) is greater than the number of co-integrating equations. If the number of co-integrating vectors is less than number of equation, then, there is a need for normalization in order to identify the long-run parameters [64]. Table 4 presents estimates of the normalized vectors and respective t-statistics (in the parentheses) to reflect how much co-integration there is for the period under study. The table shows one co-integrating equation with normalized co-integrating coefficients. This advocates that public expenditure on education and agriculture sectors have positive long-run effects on economic growth while that on transport and communication and rest of the sectors has negative long-run effects on growth. The negative sign here implies long-run inverse relationship between public expenditure on transport and communication and rest of the sectors and economic growth. These results may probably be attributed to the increasing role being assigned to private sector, especially road transport, and mobile segments and internet segment being mainly in the domain of private sector. In contrast, the positive sign represents a long-run direct relationship between public expenditure on education and agriculture sectors and economic growth.

Table 4. Normalized co-integrating coefficients

LNGDP	LNED	LNAG	LNTC	LNRPE
1.0000	0.3870	0.3010	-0.3293	-0.7133
t-statistics	(0.28850)	(4.2303)	(-6.658)	(-5.614)
In the parentheses () are t-statistics				

Source: Own Compilation.

4.4. Granger Causality Results

Existence of long-run relationship among the variables, as depicted by the Johansen test of co-integration, allows us to run Granger causality test to determine the causal direction of relationship among the variables. This implies that, if two or more variables are co-integrated, there exists causality of at least one direction, [65]. This implies that causality can either be bidirectional, or unidirectional or no causality (independent) (For more details see equations 18 and 19 in chapter three).

The study uses Vector Error Correction model (VECM) of Granger causality to identify short and long-run causality or equilibrium relationship among variables. Table 5. presents Chi-Square (Wald) statistics of first lagged differenced endogenous variables and the numbers in parentheses () show the probability values. Similarly, the numbers in squared brackets [] of the lagged error correction term are t-statistics. Results of the vector error correction model confirm that there is no long-run causality running from the four independent variables to GDP because the coefficient of lagged ECT is not negative in all equations though significant for GDP, rest of the sectors (ROS) and transport and communication (TC). The conclusion drawn from these results is that, in the long-run there is no correlation among the variables in equilibrium, and expenditure on these sectors has no significant effect on economic growth. Similarly, growth GDP of Tanzania has no long-run effect on growth of public expenditure of various sectors of the economy. But, in the short-run, there is a significant causality running from rest of the sectors to GDP, agriculture and transport and communication. As explained earlier, increasing role of private sector in post globalization era has disrupted the long-run direction of causality. Besides, there is evidence of significant causality from agriculture to education. Public expenditure on these sectors does not have any significant short-run effect on growth of GDP. It is noteworthy that investment in health, education, irrigation takes long-time to reach the stage when it starts yielding income streams. Production/completion of the process may take from 10 to 17 years in education and big irrigation projects. The study found no significant evidence showing a direct relationship between expenditure on education and GDP in the short-run. This implies that rest of the sectors like energy, mining, manufacturing and construction, social security and welfare services, general public services, tourism and others play more significant role in the growth of Tanzanian economy in the short-run than education, agriculture, transport and communication.

4.5. Residual Diagnostic Tests

The study uses various diagnostic tests to assess the robustness of the model used in the study. This is to ensure that the reported regression estimator including standard errors and t-statistics are BLUE or best linear unbiased estimator. The following tests are used to analyse robustness of residual: (i) Jarque-Bera test of normality. This test assumes that the error terms are normally distributed. Therefore, if the probability level of the significance of Chi-Square is greater than 0.05, the residuals are said to be normally distributed. The null hypothesis is; residuals are normally distributed. The results depicted in Table 6 fail to reject the null hypothesis; (ii) the second diagnostic test is Breusch-Godfrey Serial Correlation Lagrange Multiplier (LM). The test is used to determine if the residuals or error terms are serial correlated. This test hypothesizes that error terms are not serial correlated. (iii) Breusch-Pagan-Godfrey and Autoregressive Conditional Heteroskedasticity (ARCH) tests. The two tests assume the error terms are homoskedastic, but the latter test takes variance of current period's error term as a function of the preceding period's error term. These tests are distributed as Chi-square values and are more appropriate for large samples. The findings reported in Table 6 reveal that the residuals are homoskedastic because the null hypothesis is not rejected. The p-values of all four tests do not indicate significant change and thus the null hypothesis is not rejected in any case. The value of Durbin Watson (2.0181) also supports Breusch-Godfrey LM test that there is no problem of autocorrelation in the model.

Table 5. VECM Granger Causality/ Block Exogeneity Wald Tests

	Independent Variables					
Dependent variables	$\triangle GDP_{t-1}$	$\triangle ED_{t-1}$	$\triangle AG_{t-1}$	$\triangle TC_{t-1}$	$\triangle ROS_{t-1}$	ECT_{t-1}
$\triangle GDP_t$	-	0.4368 (0.5087)	1.1513 (0.2833)	0.0131 (0.9088)	4.1057** (0.0427)	0.0358** [2.3227]
$\triangle ED_t$	0.0452 (0.8317)	-	3.0436* (0.0811)	0.0065 (0.9359)	1.1477 (0.2840)	0.0942 [0.3352]
$\triangle AG_t$	1.04551 (0.3065)	1.3212 (0.2504)	-	0.0199 (0.8878)	5.5639** (0.0183)	0.2747 [0.9978]
$\triangle TC$	1.9292 (0.1648)	0.2540 (0.6142)	5.31E-06 (0.9982)	-	4.0311** (0.0447)	1.7204** [3.3096]
$\triangle ROS$	1.1462 (0.2843)	1.0881 (0.2969)	0.0251 (0.8741)	2.3643 (0.1241)	-	0.5152** [2.6340]
* and**significance level at 5 and 10 percent respectively						

Source: Own Compilation.

Table 6. Diagnostic Tests

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	0.3219	Probability	0.5742
Obs*R-squared	0.3939	Probability	0.5302
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.8035	Probability	0.1018
Obs*R-squared	15.4474	Probability	0.1166
Heteroskedasticity Test: ARCH			
F-statistic	0.3372	Probability	0.5648
Obs*R-squared	0.3515	Probability	0.5533
Normality Test: Jarque-Bera			
F-statistic	2.9822	Probability	0.2251

Source: Own Compilation.

5. Conclusion

This investigation examines long-run and short-run relationship between public expenditure on education, agriculture, transport and communication, and rest of the sectors and economic growth. The study looked at stationary properties of time series data and discovered that the components of public expenditure and GDP in Tanzanian local currency are non-stationary in their levels but stationary after differencing them once. Furthermore, the Johansen test of co-integration found one co-integrating equation. This inference depicts that the five variables have a long-run equilibrium relationship. However, with application of the VECM, it is found that all variables tend to deviate from their long-run relationship. This suggests that public expenditure on various sectors of the economy of Tanzania plays no significant role in accelerating economic growth in the long-run. This is because of the increasing role of private sector in some sectors after globalization period which has disrupted the long-run direction of causality between public expenditure and economic growth. However, in the short-run the investigation shows a significant role of public expenditure on growth of other sectors apart from agriculture, education, transport and communication on growth of the economy. Besides, the rest of the sectors (ROS) are found to have significant short-run effect on public expenditure on agriculture, education and transport and communication.

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