The Impact of Government Expenditure on Industrial Sector Productivity in Tanzania

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Abstract

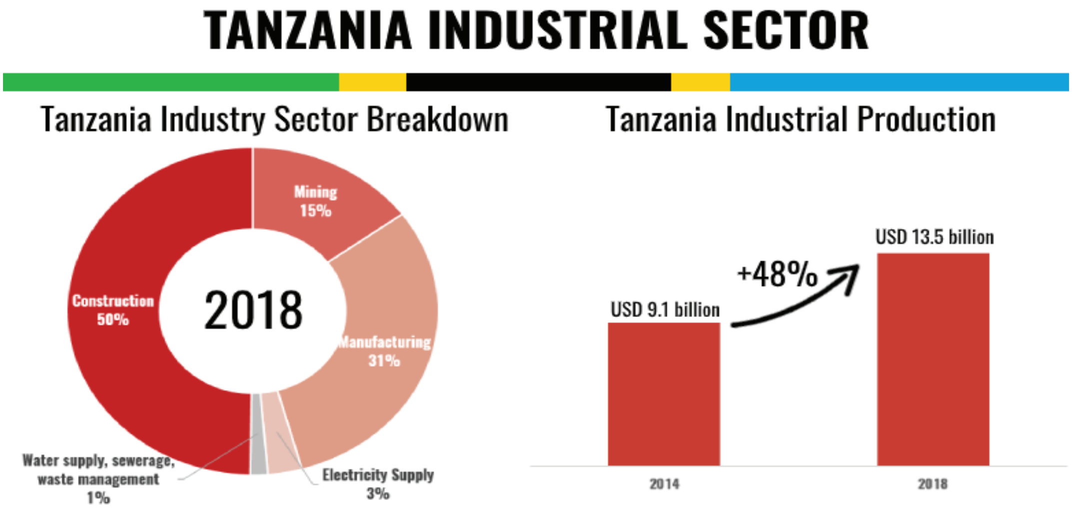
This study examines the impact of government expenditure on industrial sector productivity in Tanzania. The analysis was based on secondary annual time series data. Using data from 1980 to 2011, the study employs the Auto Regressive Distributed Lag (ARDL) bounds testing approach cointegration to examine the existence of long-run relationships and the error correction model (ECM) for the short-run relationships. All variables involved are integrated of order one while the error correction model estimates indicate the existence of a long-run relationship between government expenditure and the industrial sector productivity. Granger causality pair-wise test was conducted in determining the relationship among the variables. Analytical results show the existence of positive causality; therefore, government expenditure has significant impact on the industrial sector productivity. From a policy point of view, the focus should be on the government to adopt fiscal policy instruments with significant impact on industrial sector productivity.

Keywords: Government expenditure, industrial sector productivity, Tanzania.

1.Introduction

The Government of Tanzania considers industrialization as one key factor for economic transformation. The introduction of the Government's Sustainable Industrial Development Policy (SIDP) in 1996 is an indication of the Government's commitment to promoting the private sector to take a lead in the industrialization process. The aim was for the Government to initiate and design an industrialization program so that the country becomes semi-industrialized by 2025. The NBS and BoT have categorized the industrial sector in Tanzania to include construction, manufacturing, mining, electricity supply, water supply, sewerage, and waste management. While water supply, sewage and waste management account for 2% in size, the construction has a big share, about 50% followed by manufacturing (31%), mining (15%), and electricity (3%). Figure 1 shows the breakdown and economic share of each category as well as the total contribution of the sector to GDP for the period covering 2014 – 2018. The sector's contribution to GDP for the period was USD 13.5 billion (33%) in 2018 compared to USD 9.1 billion in 2014, recording about a 48% increase.

Figure 1: Tanzania Industrial Sector Production



Source: Tanzania Invest (2022)

This paper explores the relationship between Industrial sector productivity and government expenditure in Tanzania. The focus of the paper is to establish whether government expenditure has an influence on the performance of the industrial sector. While governments around the globe function as economic actors in terms of economic stabilization and resource allocation, more often governments undertake structural changes, including shifting resources from low productive to high productive sector to stimulate the economy. The role of the government is to balance and stabilize welfare, in so doing it intervenes in the economy by correcting inequalities caused by the market system. By performing several functions related to economic stabilization, income redistribution and resource allocation, the government intends to ensure the public maximizes social welfare (Mulamba, 2009). The central problem facing developing countries, Tanzania inclusive, is how to achieve higher industrial performance. To create a progressive and modern industrial economy. A long period of sustainable industrial growth that in turn needs a substantial amount of resources creation is required. Industrial capital creation can be undertaken through investment activities by either the government or the private sector. More often, government or public sector investment can take either direct investment through establishing state-enterprise or through fiscal policy instruments: an indirect resource allocation approach for allowing proper resources utilization by the private sector.

An important determinant of industrial sector productivity is whether the government sector supports industrial sector development. If it was to establish the state-enterprise and venture into a direct investment, the government would either need to mobilize financial resources through fiscal or monetary instruments (taxation or borrowing). Yousif et al. (2000) argue that government expenditure is inevitable in addressing and stabilizing the economy. This implies that chances are great for the government expenditure to influence industrial productivity.

The analytical work on the Government of Tanzania indicates that the government performs different roles in the economy and these roles have been expanding over time leading to a rapid increase in the government expenditure. Although government expenditure in Tanzania has been increasing over time, its impact on the industrial sector productivity in the country is still insignificant. From an economic point of view, there are opinions which support the argument that increasing government expenditure promotes industrial productivity which leads to economic growth. However, different schools of thought postulate that increasing government expenditure is likely to cause a decline of the economy (Joseph, 2012). A scenario case which can make the economy dwindle is when the government ventures directly into industrial investment or borrow funds from the open market, this is like to crowd out the private sector and creating the problems of market failure, lack of well-developed factors, products markets, and worsening terms of trade that have a compounding negative impact on domestic industrial productivity (Mbelle, 2005). With all these problems, it is therefore important to analyse the significance of government expenditure on the productivity of the industries in Tanzania.

It is observed that recurrent expenditure in Tanzania takes a larger share than the development expenditure (Tanzania Invest, 2022), this fact has caused great concern on whether the public expenditure actually impacts positively or negatively on the industrial sector. It is this concern that has necessitated embarking on this research to find out the effect of public expenditure on industrial sector productivity in Tanzania. In other words, the actual impact of government spending on industrial sector productivity is not well understood and there is a need for empirical research to be undertaken.

Also, it has been discovered from the literature that most government expenditures have been allocated to unproductive activities which did not aid industrial productivity and economic development at large. Therefore, it is on this basis that this study will indicate resource allocation pattern in the Tanzanian economy, and show whether the resource allocation pattern leads to the improvement of industrial sector productivity in particular and economic growth at large and, lastly, the economic implications of the public expenditure.

This study addresses the impact of government expenditure on the industrial sector productivity in Tanzania. The variables to be included are IIP as Index of Industrial Productivity, Government Expenditure on Education (EE), Government Expenditure on Agriculture (EA), Government Expenditure on Transport and Communication (ETC), Government Expenditure on Defense (ED), Costs of labour (CL) and costs of capital (CK). A similar variable has been employed by other studies (see Joseph, 2012 for details).

2. Literature Review

Government expenditures can influence the dynamics of industrial productivity through its consequences for the effectiveness of resource allocation and accumulation of productive resources (Aijaz Syed, 2021). For instance, an increase in government expenditures on public intermediate goods, such as building a bridge, road or financing of education, has a significant influence on industrial productivity. Firstly, fiscal policy via taxes or borrowing withdraws financial resources from the private sector and, secondly, at the time this public intermediate good becomes freely available and fully effective, it affects the productivity of the industries and labour force which use this good. The presence of the goods can lead to decreased costs (especially transaction costs) of production, save more funds for new investments in physical and human capital and could enhance the productivity of existing factors of production (Aijaz Syed, 2021).

On the contrary, underdeveloped infrastructure may distort the industry structure making it less efficient. Lack of a good road network can cause unproductive, centralization and vertical integration of the production process (Mbelle, 2005). According to Anderson (2006) the macro-economic effects of public expenditure on industrial production can be analysed through five channels through which public investment can affect industrial growth, namely increased market integration, increased national savings, complementing private capital, increased aggregate demand, and crowding-private investment.

There is a growing consensus in recent development theory that states that interventions are often necessary when market failures prevail (Wang et al., 2021). Market failures often exist in presence of externalities and natural monopolies. These market failures hinder the emergence of a well-functioning market and corrective industrial policies that are required to ensure the allocative efficiency of a free market (Wang et al., 2021). Even relatively sceptical economists now recognize that public action can boost certain development factors beyond what market forces on their own would generate.

In practice, these interventions are often aimed at regulating networks, public infrastructure or correcting information asymmetries. While the current debate has shifted away from dismissing industrial policies overall, the best ways of promoting industrial policy are still widely debatable (Aijaz Syed, 2021). In this case, therefore, it is shown that all arguments are justifiable but conflicting. The impact of government expenditure on industrial sector productivity is not theoretically clear. To solve this problem, empirical studies should be undertaken to examine the impact of government expenditure on industrial sector productivity.

In Tanzania, a number of interesting results was revealed (Mbelle, 2005). First was the fact that the performance of the manufacturing sector was deteriorating, despite increased investments in the sector in the form of capacity expansion. This happened when the supply of inputs was dwindling, and there was insufficient supportive infrastructure while employment was instead expanding steadily. The system of allocating the scarce resource, foreign exchange by then, favoured activities that created new capacities at the expense of those supporting the utilization of existing capacities. These actions had an adverse impact on labour productivity.

The effects of publicly financed infrastructure, research and development capitals on the cost structure and productivity performance of twelve two-digit US manufacturing industries were examined by (Nadiri and Mamuneas, 1994). The result suggests that there are significant productive effects from these two types of capital as shown by cost elasticity estimates which range from 0.02 to –0.21 for infrastructure and –0.04 to –13 0.01 for research and development capital. Their effects on the cost structure vary across industries. Not only is the cost function shifted downward in each industry, generating productive effects, but factor demand in each industry is also affected by two types of public capital suggesting a bias effect.

Goel (2003) conducted a study which focused on the productivity impacts of the provision of infrastructure on the registered manufacturing sector in India. The study was analysed by estimating the cost elasticity of infrastructure inputs. The study used time-series data for the period 1965 to 1999. Twenty-three infrastructure variables were used in this study that was aggregated using the principal component methodology. Three alternative specifications of the quasi-fixed inputs that are economic infrastructure, social infrastructure and aggregate infrastructure were explored. Estimated results suggest that infrastructure provision enhances productivity in the manufacturing sector and it helps to lower the costs in the sector.

The study by Mbelle (2000) found that despite numerous efforts to create a dynamic industrial environment, still Tanzania persistently has a small and underdeveloped manufacturing sector. Most initiated manufacturing investments have not survived for long, mainly because of insufficient infrastructure and inefficient macroeconomic policies. The problems in infrastructure are illustrated by the repeated water-supply crises in the capital area, which generates as much as 70-80 percent of total industrial output in the country. The lack of stable water supplies first of all affect the breweries and distillers in Dar es Salaam. Moreover, irregular power supplies from the Tanzania Electricity Supply Company (TANESCO) are continuously causing trouble for the local manufacturers.

The government's actions, such as the provision of appropriate infrastructure, have resulted in massive inflow of foreign capital to Singapore (Williamson, 2005). Government sponsorship of selected industries and foreign investment helped domestic firms to gain access to advanced technologies. During the 1990s there was a significant increase in government spending on research and development that can be attributed to the development of advanced technologies by Singaporean firms. The study examines the impact of government-funded RandD in fostering the development of Singapore's industrial production in the 1990s. Furthermore, the study explicitly considers the performance of three industries within the manufacturing sector: the machinery and equipment industry, the electrical machinery industry, and the transport equipment industry.

It is shown that the fluctuations in real government spending on RandD had a significant positive impact on the performance of the selected manufacturing industries. Moreover (Nekarda and Ramey, 2010) argued that an increase in government spending has a positive effect on industrial productivity. For example, they capture the fact that an increase in government purchases of finished aeroplanes has both a direct effect on the aircraft industries and an indirect effect on the aircraft parts industries that supply parts to the aircraft industries which is an increase in its productivity because the demand for the produced products has increased too.

An increase in government expenditure on socio-economic and physical infrastructure fosters productivity and hence economic growth (Samuel and Kabir, 2011). For example, expenditure on education and health raises the level of national output through improved quality of labour and productivity. Similarly, spending on infrastructures such as roads, communications, power and so on reduces production costs and increases the profitability of firms, thus fostering economic growth.

Based on this literature review, the following hypotheses were formulated to investigate the relationship between government expenditure and industrial sector productivity in Tanzania.

Hi: There is a negative relationship between government defense expenditure and the Index of industrial productivity.

Hii: There is a positive relationship between the government expenditure on agriculture, education, transport and communication, with the index of industrial productivity.

Hiii: The higher the costs of labour and capital the higher the index of industrial productivity.

3. Methodology

3.1 Model Specification

Autoregressive Distributive Lag Model (ARDL) is used by this study because of its advantages over other cointegration methods. First, ARDL is better suited to small samples (Haug, 2002). Second, ARDL can also be applicable, irrespective of the order of integration such as I(0) or I(1). Third, Narayan (2004) shows that estimates from ARDL approaches are much more reliable than their counterparts even if the dynamic structure is over-specified; and also that the sizes of the t-tests from an estimator that uses an ARDL approach is much more reliable. After the introduction of the variables applicable in this study, the empirical model for this study can be specified as;

$$ln\, IIP_t = \beta_0 + \beta_1 ln\, EEt + \beta_2 ln\, EA_t + \beta_3\, ln\, ETCt + \beta_4\, ln\, ED_t + \beta_5 ln\, CL_t + \beta_6\, ln\, CK_t + \varepsilon_t$$

Where;

ln IIP= logarithm of Index of Industrial Production, ln EE = logarithm of government expenditure on education, ln EA = logarithm of government expenditure on agriculture, ln ETC = logarithm of government expenditure on transport and communication, ln ED = logarithm of government expenditure on defense, ln CL = logarithm of costs of labour, ln CK = logarithm of costs of capital, ln = natural logarithm, b s= are the coefficient to be estimated, ε = error term.

Before the model was estimated, several tests, namely unit root test, Granger causality test and diagnostic tests were performed to avoid spurious regression results as our data were time series which are usually non-stationary data (Hair et al., 2014).

3.2 Data Types and Sources

This study used secondary data from various institutions including Bank of Tanzania (BoT) Economic Bulletins, Ministry of Industry and Trade, Ministry of Finance and Economic Affairs (MOF), Journals of Economic Survey, Textbooks and the Tanzania National Bureau of Statistics. The data collected ranged from the year 1980 to 2011 and the study did not employ sampling procedures since it utilized only secondary data.

Data on government expenditure on various sectors used in the analysis were obtained from the relevant ministries, Tanzania Bureau of Statistics, International Financial Statistics and Bank of Tanzania Economic Bulletins. Data on the Index of Industrial Production (IIP) were obtained from Tanzania National Bureau of Statistics (Industrial Commodities Quarterly Report). Data on costs of labour and capital were obtained from various economic surveys together with annual surveys of industrial production. Since the study has involved more sources, there is a possibility of the data from some sources being inconsistent and unreliable; that is why, to avoid this problem, only data from consistent sources were used. To address the problem further, various methods of testing the significance were employed.

4. Empirical Results and Discussion

4.1 Descriptive Analysis

The descriptive statistics in Table 4.1 show that the variables are normally distributed. The values of Skewness indicate that most variables were close to zero thus the distribution is asymmetrical around the mean. Variables, for example education, defense as well as labour and capital are negatively skewed while the index of industrial production, agriculture, transport and communication are positively skewed. Furthermore, the standard deviations (Std. Dev.) results are nonzero indicating that observations vary with time. Jauque-Bera and probability values also indicate that the variables are normally distributed as they are statistically insignificant.

Table 4.1: Summary of Descriptive Statistics

	LIIP	LEA	LED	LEE	LETC	LCL	LCK
Mean	4.55	11.85	11.60	12.16	10.94	17.16	19.38
Median	4.37	11.75	11.69	12.25	10.99	17.32	19.35
Maximum	5.31	13.85	13.75	13.26	13.37	19.85	20.99
Minimum	4.16	9.86	9.75	10.70	9.06	13.94	17.04
Std. Dev.	0.37	1.03	1.09	0.72	1.18	2.03	0.97
Skewness	0.90	0.07	-0.02	-0.35	0.21	-0.23	-0.28
Kurtosis	2.33	2.35	2.27	2.02	2.56	1.68	2.56
Jarque-Bera	4.88	0.59	0.71	1.92	0.51	2.58	0.68
Probability	0.09	0.74	0.70	0.38	0.78	0.27	0.71
Observations	32	32	32	32	32	32	32

4.2 Correlation Analysis

Table 4.2 shows the level of associations among variables. All variables have positive association except for a logarithm of government expenditure on agriculture and labour, logarithm of government expenditure on defense and cost of labour, logarithm of government expenditure on transport and communication and logarithm cost of labour. In addition, unit root was performed on each variable in levels and at first difference to avoid spurious regression. The results reported show that none of the variables were stationary in their log levels, implying that the variables are integrated of higher order other than I(0).

Table 4.2: Correlation Matrix for Variables of the Model

	LEA	**LED**	**LEE**	**LETC**	**LCL**	**LCK**
LEA	1					
LED	0.7578	1				
LEE	0.1552	0.208	1			
LETC	0.5479	0.7574	0.0395	1		
LCL	-0.2112	-0.3124	0.475	-0.1126	1	
LCK	0.2613	0.3809	0.5657	0.414	0.319	1

4.3 Granger Causality Test

The Granger causality test is used to look at the direction of the relationship that exists between the variables. Granger causality tests are done to determine whether the current and lagged values of one variable affect each other. The results of the likely feedback amongst the variables in the model are reported in Table 4.3.

Table 4.3: Pairwise Granger Causality Test

Null Hypothesis:	Observation	F-Statistic	Prob.
LEA does not Granger Cause LIIP	30	1.2862	0.2940
LIIP does not Granger Cause LEA		0.10435	0.9013
LED does not Granger Cause LIIP	30	1.5666	0.2286
LIIP does not Granger Cause LED		0.24006	0.7884
LEE does not Granger Cause LIIP	30	1.0908	0.3514
LIIP does not Granger Cause LEE		2.42234	0.1092
LETC does not Granger Cause LIIP	30	1.2009	0.3177
LIIP does not Granger Cause LETC		2.10634	0.1428

LCL does not Granger Cause LIIP LIIP does not Granger Cause LCL	30	2.0932 2.42651	0.1444 0.1089
LCK does not Granger Cause LIIP LIIP does not Granger Cause LCK	30	5.5245 3.83807	0.0103 0.0352

Since the probability value is greater than 10 percent in the first, second, third, fourth, and fifth cases, we fail to reject null (Ho) and conclude that the variables do not Granger cause each other. In other words, there is no causality between them. In the sixth case, in hypotheses one and two, the probability value is less than 5 percent critical level, therefore we reject null hypothesis (Ho) and conclude that LCK granger because LIIP and LIIP granger cause LCK. This means that there is bi-directional causality between LIIP and LCK. This implies that the past value of LIIP can be used to estimate or determine the present value of LCK and the past value of LCK can be used to estimate or determine the present value of LIIP.

4.4 Diagnostic Test

The model passes through all diagnostic test of serial correlation, heteroscedasticity and normal distribution at 10 percent level of significance. The results of the diagnostic tests indicate no confirmation of serial correlation as the LM (LM=0.59) version indicates an insignificant probability even at 10 percent. The test of heteroscedasticity test (BPG) is also not statistically significant as the coefficient value is 0.45. The residual term is normally distributed as Jaque Bera Test (JB=4.35) the probability value using LM version is 0.529 which is greater even at ten percent as presented in table 4.4a below.

Table 4.4: The results of Diagnostic Test

Serial Correlation Test	**Value**	**F-statistics**
BG-LM Test	LM= 0.59	F-Statistics: 0.358
Heteroscedasticity Test		
Breusch-Pagan-Godfrey (BPG)	BPG =0.45	F-statistics= 3.03
Normal Distribution Test		
JB: (Normality Test)	JB= 4.35	F statistics=0.45

Similarly, the model has passed the different model specification tests at 10 percent level of significance. The Ramsey Reset (LM=0.91) test indicates that the functional form of the model is well specified. The Chow test for the structural break for the year 2000 also shows not significant as the F-Statics become insignificant at 10 Percent.

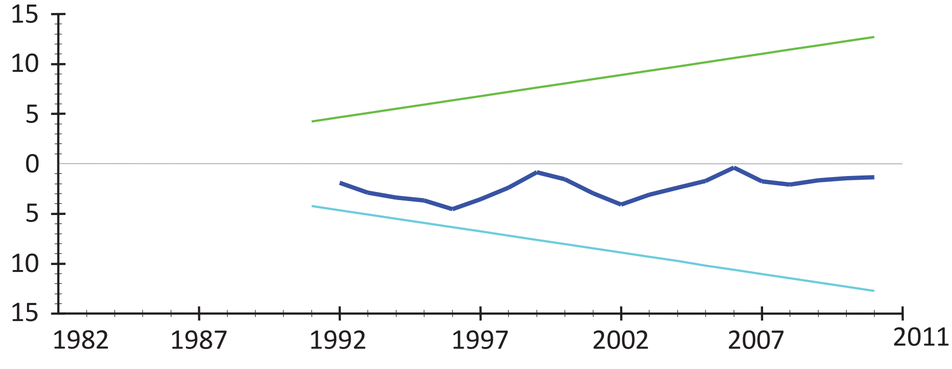
Table 4.5: Model Specification Test

Test	Value	F-statistics
Ramsey Test Specification Test	LM= 0.91	0.92
Chow –Structural Break Test	Restricted Test = 406	0.23
Chow –Structural Break Test	Unrestricted Test= 452	0.34

4.5 Stability Tests

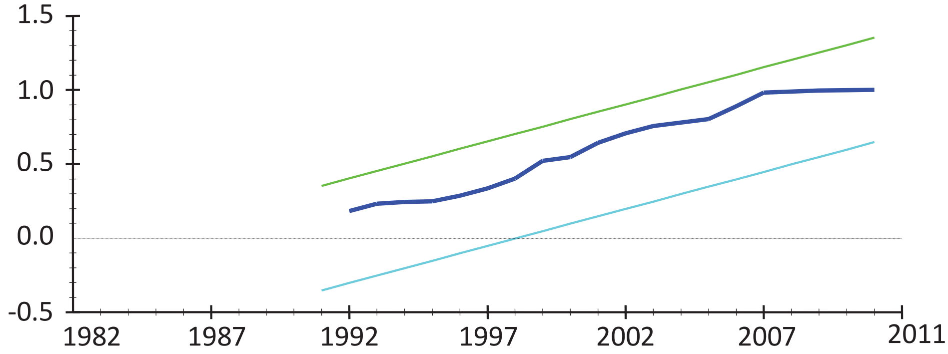
The stability tests have been used to investigate the stability of long-run and short-run parameters. In doing so, cumulative sum (CUSUM) and cumulative sum of squares (CUSUMsq) tests or techniques have been employed and the results are shown in Figures 4.5 and 4.6, respectively.

Figure 2 Plot of Cumulative Sum of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

Figure 3 Plot of Cumulative Sum of Squares of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

The graphs of both CUSUM and CUSUMsq are presented in Figures 4.6 and 4.7. The figures specify that plots for both CUSUM and CUSUMsq are between critical boundaries at 5 percent level of significance. This confirms the accuracy of long-run and short-run parameters which have an impact on the index of industrial production in the case of Tanzania. Moreover, both tests also verify the stability of ARDL model for structural stability. This indicates that the model seems to be steady and specified appropriately.

4.6 Estimated Long Run Coefficients Using the ARDL Model

The computed F-statistics is 5.5093 as indicated in the error correction model in Table 4.3 and the upper critical bound is 3.413 at five percent. Therefore the computed F-value which is 5.5093 is higher than the upper critical bound value at five percent as presented in Table 4.6 below. Hence, we conclude that there is evidence of a long-run relationship between the variables. Moreover, the ARDL can also be applicable irrespective of the order of integration. The crucial criteria are that the order of integration should be less than two. The dependent variable is run on independent variables and the residuals (ECM) are obtained.

Table 4.6: Estimated Long Run Coefficients Using the ARDL Approach

ARDL (1, 0, 0, 1, 0, 0, 0) selected based on Schwarz Bayesian Criterion Dependent variable is LIIP; 30 observations used for estimation from 1982 to 2011			
Regressor	**Coefficient**	**Standard Error**	**T-Ratio [Prob]**
LEA	-0.15267	0.021995	-6.9413 [.000]
LED	0.050868	0.033253	1.5297 [.141]
LEE	0.22068	0.037675	5.8573 [.000]
LETC	0.093013	0.022526	4.1291 [.000]
LCL	0.11581	0.013257	8.7356 [.000]
LCK	0.050733	0.025623	1.9799 [.061]
C	-0.88507	0.31558	-2.8046 [.011]
R-Squared	0.98863	R-Bar-Squared	0 .98430
S.E. of Regression	0.046842	F-stat. F(8, 21)	228.3014 [.000]

4.7 Interpretation

The government expenditure on agriculture has a negative impact on the index of industrial production, and it is significant at 1 percent. For Tanzania, a 1percent increase in the government expenditure on agriculture leads to a decrease in the index of industrial production by 0.15267 percent on average, ceteris paribus. This is somehow surprising because we expected to have positive relationship between these two variables. An implication of this is that, maybe funds which were supposed to be used by the government in the industry sector are instead used in the agriculture sector. So, when the government increases its spending on the agriculture sector, its spending on the industry sector decreases, hence reduces its productivity.

Furthermore, there might be some mismanagement of funds in the agriculture sector which leads to a contrary relationship with the industrial sector productivity even though the government expenditure in this sector increases. In addition, bad weather conditions and drought might disrupt agricultural production although the government spending might still be high in the sector. The government expenditure on defense is positively related to the index of industrial production, but it is not statistically significant.

A 1 percent increase in the government expenditure on defense leads to the 0.050868 percent increase in the index of industrial production, ceteris paribus. It is a little bit surprising because the expectation was a negative relationship between these two variables, but the contrary relationship may be because when there is peace and harmony in the country people concentrate on producing rather than fighting or seeking peace, hence productivity increases. There is a positive relationship between the government expenditure on education and the index of industrial production and it is significant at 1 percent. This means a 1 percent increase in the government expenditure on education leads to the 0.22068 percent increase in the index of industrial production, other factors remaining constant.

The government expenditure on transport and communication has a positive impact on the index of industrial production and it is significant at 1 percent. Its implication is that, a 1 percent rise in the government expenditure on transport and communication leads to the 0.093013 percent increase in the index of industrial production under ceteris paribus condition. When the costs of labour increase, the index of industrial production also increases and it is significant at 1 percent, implying that, a 1 percent increase in the costs of labour leads to the 0.11581 percent increase in the index of industrial production, ceteris paribus. This means that, when the industrial sector employs more labour or when it employs skilled labour, the costs of production increases but also the industrial productivity increases. In parallel, when the industrial sector pays higher wages to motivate workers, the labour efficiency increases which leads to the increase in the industrial sector productivity under ceteris paribus.

The relationship between the costs of capital and the index of industrial production is positive and significant at 10 percent, implying that, a 1 percent increase in the costs of capital leads to the 0.050733 percent increase in the index of industrial production when other factors remain constant. The implication for this is that, when the sector buys or hires more capital such as machines or when it employs high technology, modern machines or is usually repairing machines to increase machine's efficiency. When the costs of production increase the index of industrial production also increases under ceteris paribus. The coefficient of determination (R-squared and Adjusted R-squared) suggests that the dependent variable is well explained by the explanatory variables as indicated by R-squared and Adjusted R-squared of 0.98863 and 0 .98430, respectively. The whole model is significant as indicated by the probability value of 0.000 which is very significant at 1 percent.

4.8 Error Correction Model (ECM)

After realizing that there is the existence of long-run relationship among the variables which means variables are cointegrated, the Error Correction Representation for the Selected ARDL Model is applied to estimate the model. When a long-run relationship exists, there must be some forces that will pull the equilibrium error back towards zero; the error correction representation for the ARDL model does this exactly.

The ECM is treated as the equilibrium error as it is used to tie the short-run dynamics of the data to the long-run value (Gujarati and Sangeetha, 2007). Therefore, the short-run adjustment process is examined from the ECM. If the coefficient of ECM lies between 0 and -1, the correction to IIP (Index of Industrial Production) in period t is a fraction of the error in period t-1. In this case, the ECM causes the IIP to converge monotonically to its long-run equilibrium path in response to the changes in the exogenous variables. If the ECM is positive or less than -2, this will cause the IIP to diverge.

In the case where the value is between -1 and -2, the ECM will produce dampened oscillations in the IIP around its equilibrium path. ECM is between 0 and -1 and is statistically significant at 1 percent level as shown in Table 4.5. This implies that the error correction process converges monotonically to the equilibrium path. In our case the coefficient of ECM_{t-1} is - 0.61170 and significant, again confirming the existence of established cointegration. It also implies that a deviation from the equilibrium level of IIP during the current period will be corrected by 61.17 percent in the next period.

An estimation of the Error Correction Model in this study is done by taking into account the first lagged error correction term and other stationary variables of the model after the first difference. The error correction term is a residual from the static long-run regression which joins stationary variables in the model to capture both the short run and long-run dynamics. Therefore, following the error correction representation for the ARDL model, the following results were generated as indicated in Table 4.8.

Table 4.8: Error Correction Representation for the Selected ARDL Model

ARDL (1, 0, 0, 1, 0, 0, 0) selected based on Schwarz Bayesian Criterion (SBC)

Regressor	Coefficient	Standard Error	T-Ratio [Prob]
DLEA	- 0.093390	0.020555	-4.5435 [.000]
dLED	0.031116	0.020084	1.5493 [.136]
dLEE	0.067084	0.022730	2.9513 [.007]
dLETC	0.056896	0.019269	2.9527 [.007]
dLCL	0.070842	0.014190	4.9925 [.000]
dLCK	0.031034	0.018087	1.7157 [.100]
Dc	- 0.54140	0.20207	-2.6793 [.014]
ecm(-1)	- 0.61170	0.13072	-4.6796 [.000]
R-Squared		0.64744	
R-Bar-Squared		0.51314	
F-statistics F (7, 22)		5.5093[.001]	
Residual Sum of Squares		0.046078	

The error correction term ECM (-1) has expected negative sign and significance at 1 percent level. Its magnitude reports the speed for adjustment of around 61.170 percent, which is relatively high. This implies that about 61.170 percent of the deviations from the long-run equilibrium are corrected in one period. The significance of error correction term substantiates the presence of cointegration between the dependent variable and the explanatory variables. Moreover, after the application of Error Correction Representation for the Selected ARDL Model, all variables have neither changed their sign nor significance with exception of the logarithm of capital (LCK) which was significant at 10 percent. However, the error correction model is not statistically significant as indicated by its probability value of 0.1.

The coefficient of determination (R-squared and Adjusted R-squared which are 0.64744 and 0.51314 respectively) suggests that the dependent variable is well explained by the explanatory variables. The probability of the F-Statistic (0.001) suggests that the model has a very good fit. The results support the previous one since the variables constitute a cointegrated set.

5. Conclusion and Recommendations

5.1 Conclusion

This study examined the impact of government expenditure on the industrial sector productivity in Tanzania. Findings from the empirical analysis of this study have indicated that expenditure on agriculture, education, labour, capital, transport, and communication are statistically significant while expenditure on defense is insignificant in determining the industrial sector productivity in Tanzania. Moreover, expenditures on education, defense, labour, capital, transport and communication are positively related to the index of industrial sector productivity while expenditure on agriculture is negatively related to the index of industrial sector productivity in Tanzania.

Specifically, the government expenditure on agriculture has a negative impact on the index of industrial production, and it is significant at 1 percent. This implies that maybe funds which were supposed to be used by the government in the industry sector are instead used in the agriculture sector so that when the government increases its spending on the agriculture sector spending on the industry sector decreases consequently reducing its productivity. There might also be the mismanagement of funds in the agriculture sector which leads to a contrary relationship with the industrial sector productivity even though the government expenditure in this sector increases. Moreover, the bad weather condition and drought might disrupt the agricultural production nevertheless the government spending might still be high in the sector.

The government expenditure on defense is positively related to the index of industrial production, but it is not statistically significant. This implies that defense has not played an important role in enhancing Tanzania's industrial productivity. This could possibly be explained by the fact that defense has an indirect effect on industrial productivity. That is to say, defense maintains peace and security that enable people to work well and finally contribute to the increase in the industrial sector productivity. Moreover, the government expenditure on education and the index of industrial production are positively related and significant at 1 percent. This means when the government expenditure on education increases the industrial sector productivity also increases, keeping other factors constant.

The government expenditure on transport and communication has a positive impact on the index of industrial production and it's significant at 1 percent, it implies that, when the government improves the means of transport and communication such as roads, railways, airports, ports, telephones, etc, the industrial productivity would increase under ceteris paribus condition. When the costs of labour increase, the index of industrial production also increases, implying that, when the industrial sector employs more workforce or employs skilled labour, the costs of production increase, likewise the industrial productivity increases.

Similarly, when the industry sector pays high wages to motivate workers, the labour efficiency increases which leads to an increase in the industrial sector productivity when other factors remain constant. There is a positive relationship between the costs of capital and the index of industrial production. This implies that when the sector buys or hires more capital such as machines, or when it employs high technology machines or when it regularly repairs machines to increase machines' efficiency, the costs of production increase and similarly the industrial productivity also increases, keeping other factors constant.

Finally, costs of capital granger cause index of industrial production and vice versa. This means that there is bi-directional causality between the logarithm of costs of capital and the index of industrial production. This implies that the past value of the logarithm of the index of industrial production can be used to estimate or determine the present value of the logarithm of costs of capital. Likewise, the past value of the logarithm of costs of capital can be used to estimate or determine the present value of the logarithm of index of industrial production.

5.2 Policy Recommendations

In the light of the findings of this study, several policy implications can be drawn from it. From this study, it is suggested that, in setting the government expenditure targets, the government should adopt policies that encourage expenditure on education, transport and communication. It is evident that the increase in expenditure on these sectors positively affect the industrial sector productivity.

It is recommended for the government to create a favourable environment for investors to invest in private sectors, transport, communication and as well as education. In addition, the government should encourage donors to allocate grants in these sectors which significantly and positively affect the industrial sector productivity.

The government through the industrial sector should continue employing more workforce who are skilled and pay competitive wages in order to motivate them and increase their efficiency and, as a result, raise their productivity in the industry.

The significance of government spending on education, transport and communication on labour and capital obtained in this study implies that policymakers need to put an extra effort into improving these macroeconomic indicators of the economy if benefits are to be yielded from the industrial sector. Moreover, policymakers and the government, in general, may encourage the agriculture sector and ensure that resources allocated to the agriculture sector are used according to the intended purpose and are properly managed. This is aimed at stimulating the agricultural production in order to increase the amount of raw materials used in the industrial production so that it yields a profitable impact on the industrial sector productivity, as it is known that the agriculture sector is the backbone of the economy in Tanzania.

Furthermore, funds should be spent economically with more attention to accountability and transparency, where capital expenses must be on sectors such as education, general infrastructure, as well as on labour and capital that could serve as a solid foundation for industrial take-off.

Based on the findings of this research work, it can therefore be recommended generally that it is prudent for policymakers to use public expenditure policies to stimulate industrial productivity in Tanzania. Furthermore, this study focused on the industrial sector, future studies may include more sectors in examining government expenditure and its contribution to economic growth.

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