An Empirical Investigation of the Role of Manufacturing and Economic Growth: The Case Study of Tanzania

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Abstract

This study examines the effect of manufacturing sector in the economic growth of Tanzania, using annual time series data from 1985 to 2017. The study employed the Ordinary Least Square technique whereby Kaldor's first law was triangulated with exogenous theory to examine the role of manufacturing in the economic growth of Tanzania. Augmented Dickey-Fuller (ADF) test was used to test for stationarity. The variables regressed included economic growth, manufacturing growth, exports and employment growth. Granger Causality test revealed that there was unidirectional relationship running from economic growth to manufacturing growth contrary to what was hypothesised. In general, the findings were not in favour of the applicability of the Kaldor's first law in Tanzania because causality was running from economic growth to manufacturing growth instead of running from manufacturing to economic growth. This implies that the economy of Tanzania is driven by other sectors apart from manufacturing. It is thus observed that more efforts to improve and sustain manufacturing growth would make manufacturing the engine of economic growth. Intuitively, from the policy point of view the findings entails that in order to make manufacturing sector the engine of economic growth, enabling conditions to propel growth of the economy, necessary factors like capital availability, technological advancement, availability of skilled labour and promotion of export led manufacturing growth is necessary.

Keywords: manufacturing, growth, employment and causality

Introduction

After its independence in 1961, Tanzania inherited from colonial masters a small and unattractive industrial sector. Development of the sector, especially the manufacturing sub sector, was the centre of all strategies for economic growth since then (Wangwe et al., 2014). While implementation of the strategies was in progress, economic recession occurred around the 1970s, which was followed by financial meltdown in the 1980s. The economic recession was due to several reasons such as inefficiency in economic policies that the country opted for in the Arusha Declaration in 1967. There were also exogenous factors that weakened trade and fuelled economic recession around the 1970s and 1980s such as the downfall of the East African Community in 1977 and the war with Uganda in the late 1978–79 (Damian, 2013).

In this period there were several policies that were endorsed and implemented to increase and sustain economic growth. Among the policies were the Structural Adjustment Programme (1986 - 1989), a unified foreign exchange rate (1989 - 1992) and the National Investment Promotion Policy

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of 1990. The government also undertook privatization in 1993 in order to increase efficiency in the production of goods and services (NAO, 2011). However, the government established several legal frameworks for supporting economic growth. Among them were the Tanzania Investment Act of 1997 and the Public Procurement Acts (PPA) of 2001 and 2004. Others were the National Investment Promotion Policy of 1996 and the Big Results Now (BRN) initiative of 2013.

The contribution of manufacturing growth to economic growth was at the average of 6.9% in the first ten years of independence (1961-1970) then increased to 10.6% between 1971-1980 but dropped to 8.8% in 1981-1990 and 8.1% in 1991-2000 (Wangwe et al., 2014). Further dropping to the average of 7.7% was witnessed between 2001-2010. Due to that, Tanzania has been facing the unemployment, unfavourable terms of trade, slow and inconsistent economic growth and depreciation of her currency against international currencies. These are the shocks that a well-developed manufacturing sector has the ability to absorb (Zalk, 2014). When comparing with the available country's natural resources, surplus labour and the ongoing economic reforms, this performance of the manufacturing sector is not impressive and so becomes an insightful basis of concern. In emerging countries that structural transformation has already taken place, a good number of people have been pulled out of poverty miseries. It is because of those reasons that this study seeks to examine the role of manufacturing to the economic growth of Tanzania and add to the literature on the applicability of Kaldor's first law in the economic growth of Tanzania.

Manufacturing and Economic Performance Overview

Manufacturing industries have been viewed as crucial in the economic transformation of Tanzania since the post-independence leadership in order to decrease dependence on colonial powers. A severe reduction of the role of manufacturing industries in the economic growth occurred because the industries established after independence could not survive, which led to a long period of wavering industrial progress. Figure 1 indicates the trend of manufacturing growth in Tanzania from 1986 to 2017.

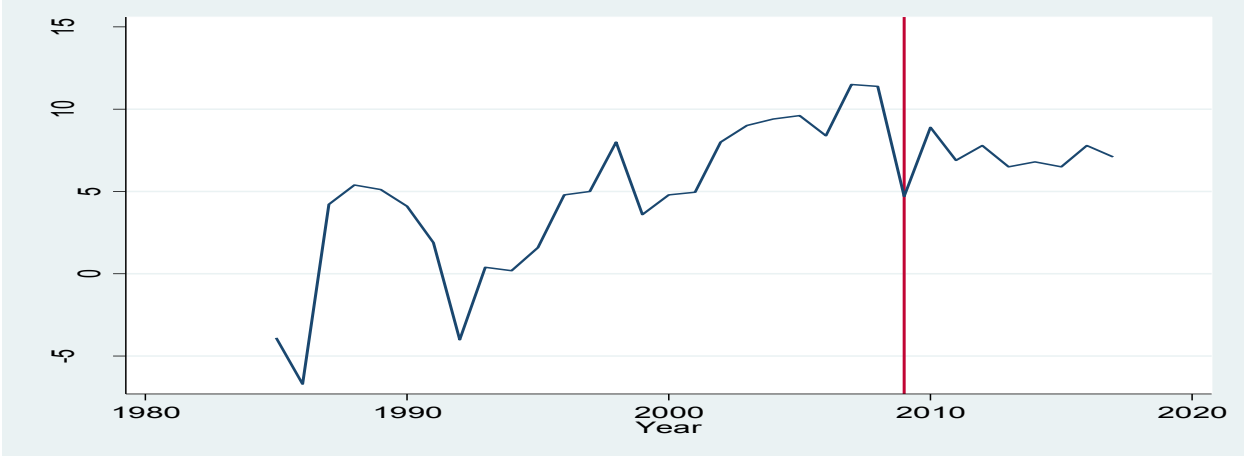

Figure 1: The Trend of Manufacturing Growth in Tanzania: 1986-2017

The declining trend indicated in figure 1 implies some signs of deindustrialization. This is exhibited with significant changes that took place in 2009 as shown by the structural breaks. The manufacturing sector's share to GDP was high with a contribution to GDP averaging at about 8.2% per year from 1986 to 2004 and later dropped to an average contribution of about 6.8% per year

from 2005 to 2017. Figure 2 indicates the contribution of manufacturing to economic growth from 1986 to 2017. The figure also indicates that the average contribution per year started to increase in 2017 after a sharp fall in 2005 and 2015 while the structural breaks indicates that significant changes occurred in the year 2013.

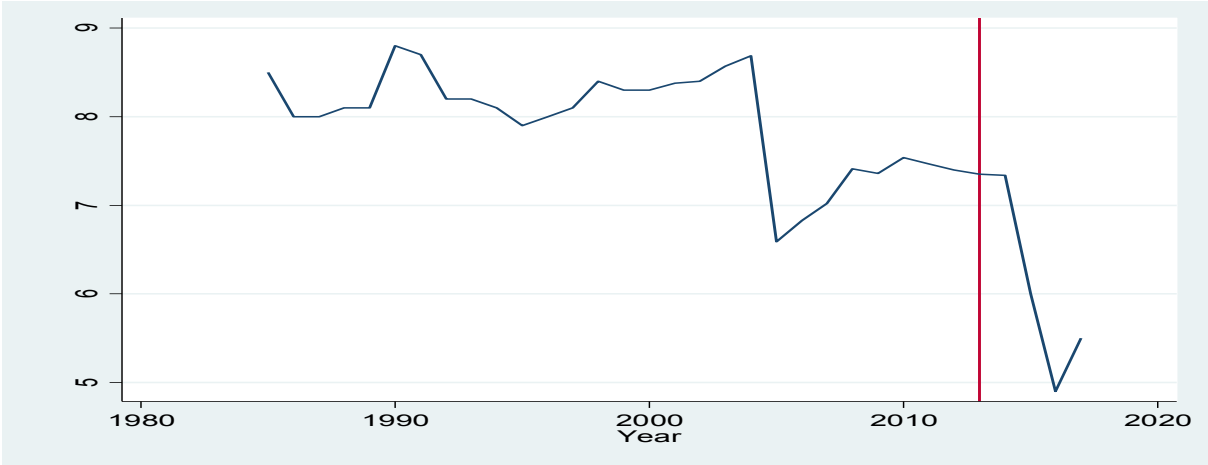

Figure 2: Contribution of Manufacturing to GDP: 1986 - 2017

Literature Review

Kaldor's first law posits that manufacturing drives the economy. According to the law there is a positive relationship between manufacturing and economic growth ($g_{gdp=}a_{1+}a_2Q_m$, a2 > 0). Where g_{gdp} and Qm are the growth of GDP and manufacturing output respectively. a2 indicates positive relationship between the two variables. The reason for the manufacturing sector being the engine of economic growth is that there is excess labour in the non - manufacturing sectors. This means that productivity of labour in the manufacturing sector is greater than any other sectors. The other reason is that the increase in demand and production in the manufacturing sector does not cause declining effect in the production of other sectors. This means that the manufacturing sector is subjected to dynamic economies of scale (Kaldor, 1975). Kaldor's argument is that causation between manufacturing and economic growth runs from manufacturing to economic growth. Manufacturing is the engine of economic growth because it generates revenues, symbolizing constant improvement of technology through its goods and its output lead into the upsurge of employment which results into transfers of labour from lower productivity activities (Kaldor, 1975).

Endogenous growth theorists assumed that technological change was at the heart of economic growth. They incorporated the theory of technological progress, a central element of long run growth that was missing in the neoclassical theories. The Cobb Douglas production function is one of the endogenous theories that provides a technological relationship between inputs and outputs. The production function uses a functional form $Y=AK^{\alpha}L^{\beta}$. Where L = Labour input, K= Capital input, A = efficiency parameter or total factor productivity while α and β are elasticity coefficients. According to the theory, if labour or capital decreases, the amount of production also decreases. The theory adds that marginal productivity of labour is proportional to production per unit of labour and the same applies to the marginal productivity of capital. According to them, technological change can occur as a result of some efforts. Romer (1986)'s analysis has put it clear

that through investment in research and knowledge, the increase in marginal productivity and per capital income can be obtained. Lucas (1986)'s analysis rests on economic growth which is obtained through increase of labour skills by schooling or job training. A point of departure between endogenous and exogenous model is the exhibition of constant or increasing and not diminishing returns in capital. Mankiw et al. (1992) considered human capital and technological transfer as prerequisites for economic growth.

Empirical Literature

Jeon (2006) revealed that using time series and panel data analysis Kaldor's law was supported in China. Chakravarty and Mitra (2009) used a VAR model and determined that manufacturing was the India's driver of economic growth. A similar study on India by Dasgupta & Singh (2006) used OLS to test Kaldor's law in and established an indication of deindustrialization particularly in growing economies with low income, unemployment growth and fast growth in informal sectors. They also studied manufacturing growth in formal and informal sectors. Results showed that manufacturing was still a key sector to the economy of India. Oburota et al. (2017) employed OLS to test Kaldor first law and endogenous growth theory in Nigeria. The study exposed that manufacturing output, technology and capital put forth remarkable effects in the Nigerian long and short run economic growth. A study by Tsoku et al. (2017) employed Ordinary Least Square to analyse the relationship between Manufacturing and Economic Growth in South Africa. Johansen co-integration was employed to test for Kaldor's hypothesis and discovered that there was a long run association between manufacturing and economic growth. This implied that policies and strategies in South Africa were to align in enhancing growth in the manufacturing sector to increase economic growth (Tsoku *et al*, 2017).

Luciano & Luiz (2019) investigated how manufacturing affected economic growth especially in developing countries. The study revealed that manufacturing could work as the engine of economic growth in developing countries. Adam Szirmai and Bart Verspagen (2015) re-examined the role of manufacturing as a driver of economic growth in developed and developing countries between 1950 - 2005. The study established that there was a moderate positive impact of manufacturing on economic growth. A study by Evans (2014) in Kenya employed OLS analytical techniques with data covering the period of 1971-2013 and revealed that results could not support Kaldor's law; meaning that manufacturing was not the engine of Kenya's economic growth. Evans, (2014) conducted another study on Manufacturing Industry and Economic Development in Eastern Africa for the period of 2000 - 2013 to test applicability of Kaldor's first law. The countries were Kenya, Uganda, Tanzania, Rwanda, Burundi and Ethiopia. The results showed that Kaldor's first law was supported in these countries contrary to the study obtained by Heather and Thirlwall which was conducted in selected African countries for the period of 1980 – 1996.

Heather & Thirlwall (2003) tested Kaldor's Laws across countries in Africa and found that there was support for three Kaldor's laws in in a sample of African Countries. It was discovered that economic growth was more linked to manufacturing growth than to agriculture or service sector. They then proposed that structural changes should be accelerated in favour of manufacturing for growth of the economies and high living standards in Africa. Along the same line, Penélope et. al. (2013) studied new interpretation of Kaldor's first growth law for 89 open developing economies including Tanzania over the period of 1990 – 2011 and discovered that there was a close association between economic growth and export growth in those countries.

Zidong et. Al. (2017) investigated the relationships between economic growth and employment growth in low middle-income countries that included Tanzania. The study established that on average, employment growth decelerations were associated with GDP growth down – breaks. However, employment accelerations had no association with GDP growth up – breaks.Clement and Leward (2019) studied Manufacturing Sector and Economic Growth in selected African Countries including Tanzania. The study showed that manufacturing value added was positively related to economic growth, thus providing support for Kaldor's law in those Countries.

From the foregoing literature reviews it can be concluded that manufacturing sector is the engine of economic growth in some countries while in others, especially the developing ones, the surge in other sectors such as the service sector could not give manufacturing a place to act like an engine of economic growth. In Tanzania, particularly, there are studies which came with results that Kaldor's First Law was supported while others did not support the findings. In view of this review, this study will add to the literature and deepen our knowledge on the role of manufacturing as an engine of economic growth with respect to the applicability of Kaldor's first law in a developing country perspective and Tanzania in particular.

Study Methodology

This is a time series study using annual data ranging from 1985 to 2017. The sources of data used are the National Bureau of Statistics of Tanzania, Bank of Tanzania, Ministry for Industries and Investment, United Republic of Tanzania (URT) Economic Surveys, International Monetary Fund, World Bank and World Development Indicators (WDI). Data collection was through documentary review of different reports published by the mentioned sources. Data were expressed in Tanzanian shillings and US dollar. The key series used are economic growth and manufacturing growth. Exports and employment were used as additional variables. All variables were transformed into logarithmic form to stabilize variance. In most cases, time series do not have constant mean and variance. Verifying for stationarity helped to get the valid t and F test which can lead to proper inference (Gujarati, 2004). The non-stationary data in this study were made stationary by differencing. Stationarity was tested using Augmented Dickey-Fuller (ADF) test which is a popular test for unit root tests.

Theoretical Justification of the Model

The empirical formulation of the study tried to capture the causal link between GDP and economic growth with Exports and Employment growth as additional variables which have close link to economic growth. The first Kaldor's law states that manufacturing and economic growth have a close relationship; $\mathrm{Y} = \mathrm{F}(\mathrm{MAN})$. The linear specification is expressed aa:

$$\mathrm{Y} = a_1 + b_1(\mathrm{MAN}) \quad \text{..... (1)}$$

Where Y is economic growth and MAN manufacturing growth. However, it is assumed that economic growth and exports have positive relationship. Equation 2 indicates relationship between economic growth and growth of exports.

$$Y = a_1 + b_1(\mathrm{EXP}) \quad \text{.....(2)}$$

where Y is the growth of GDP and EXP is the growth of exports. The extent to which export growth governs output growth (b_1) can be called the dynamic Harrod trade multiplier result (McCombie and Thirlwall, 1994, 2002; Thirlwall, 2011).

However, Employment too is perceived to have positive impact to economic growth in any economy via the theory of derived demand (UNCTAD/ALDC/2018/3). The chain of derived demand is created by three distinctive components such as raw materials, processes materials and labour (Longley, 2020). The linear relationship is shown in equation 3 below.

$Y = a_1 + b_1(\mathrm{EMP})$..... (3)

where Y is the growth of GDP and EMP is employment growth and b_1 is the extent to which employment influences economic growth. Substituting equation 2 and 3 into 1 the model becomes;

$Y = \mathrm{F}(\mathrm{MAN}, \mathrm{EXP}, \mathrm{EMP})$.....(4)

Where; Y is economic growth whereby MAN stands for Manufacturing Growth, EXP for Exports and EMP for Employment Growth. A dummy DU93 was added to capture structural breaks. It captures the effect of unification of the exchange rate in 1993. Hence equation 5 is transformed into log form to form the following econometric equation:

$\ln\mathrm{GDP_t} = \beta_0 + \beta_1 \ln\mathrm{M_{gt}} + \beta_2 \ln\mathrm{EXP_t} + \beta_3 \ln\mathrm{EMP_t} + \mathrm{DU93} + \varepsilon_t$ .....(5)

Gross domestic product is a dependent variable, while manufacturing growth, exports and employment growth are independent variables. To the best knowledge of the researchers, this kind of model has not been used in the Tanzanian context. The model is appropriate to the Tanzanian context because of the close link existing between economic growth, manufacturing, exports and employment. Logarithms have been used to go away with non-linearities, making possible interpretation of the coefficients as elasticities and fix non-normality while ε (error term) stands for unobserved factors.

Co-integration Test

In this study, Johansen co-integration test was employed to test for co-integration among variables. This test is useful in spotting multiple co-integrating vectors (Gujarat, 2004).

Discussions of the Results

Four initial results were conducted. Those are unit root tests, diagnostic test, Multicollinearity Test and Model Specification Test. The results are as shown in table 1 and 2 respectively.

Unit Root Test Results

In table 1, the null hypothesis which was tested was whether there was unit root or the time series was not stationary ($\delta = 0$). Augmented Dickey Fuller (ADF) test was applied to models to test for stationarity. The test was conducted by augmenting three equations (models) by adding the lagged values of the dependent variable (Gujarat, 2004). For every variable three different null hypotheses were tested as shown in Table 1.

Table 1: Unit Root Test Results

Serie	Model (s)	Test statistics	Prob	5% Critical values	Conclusion (s)
D.LGDP	Intercept	-3.636	0.0051*	-2.980	Stationary
	Trend + intercept	-5.001	0.0002*	-3.572	Stationary
	None	-0.582	0.565	-1.950	Non-stationary
D.LMG	Intercept	-2.882	0.0475	-2.980	Non-Stationary
	Trend + intercept	-3.331	0.0613	-3.572	Non-Stationary
	None	-1.219	0.232	-1.950	Non-stationary
D.LEXP	Intercept	-5.574	0.0000*	-2.980	Stationary
	Trend + intercept	-5.582	0.0000*	-3.572	Stationary
	None	-3.174	0.003*	-1.950	Stationary
D.LEMP	Intercept	-5.728	0.0000*	-2.980	Stationary
	Trend + Intercept	-5.658	0.0000*	-3.572	Stationary
	None	-5.658	0.000*	-1.950	Stationary

Null hypothesis: Ho = There is unit root. * Significant at 5% significance level

Results in some of the models of GDP and MG revealed that there was unit root in some models at the levels with intercept, trend and intercept and none. The null hypothesis was accepted where Test Statistics value was less than the Critical Value at 5% and rejected where Test Statistics value was greater than Critical Value at 5%. Non stationary variables were differenced to make them stationary.

Table 2: Diagnostic, Multicollinearity and Model Specification Test

Na.	Test type	Name of Test	Prob.	Na.	Test type	Variable	VIF	1/VIF
I	**Diagnostic Tests**	Breusch-Godfrey Test (BG)	0.2412	**II**	**Multicollinearity Test**	lnMG	1.25	0.797012
		White's test	0.6014			lnEXP	1.17	0.853632
		Breusch-Pagan	0.4389			lnEMP	1.1	0.908804
		Jarque-Bera (JB)	0.2597			**Mean VIF**	**1.18**	
III	**Model Specification Test:** Ho. Model has no omitted variables							
		F(3,13) =	1.72					
		Prob >F =	0.2125					

As shown in table 2, test Na. I., the probability value was greater than 5%; Breusch-Godfrey (BG) discloses that there was no serial autocorrelation in the residuals, while the White's test and Breusch Pagan tests revealed that there was no heteroscedasticity. The diagnostic test through Jarque-Bera (JB) tests concludes that residuals were normally distributed. In test Na. II, VIF measured the extent to which the variance of the estimated regression coefficient was overstated by the presence of

correlation among the variables in the model. The mean VIF obtained was 1.18, which proves that there was no multicollinearity.

In test Na. III., Ramsey reset test was conducted to determine whether the model was well specified. The test showed that the model was well specified since the p-value was greater than 5%. This made the null hypothesis acceptable implying that there were no omitted variables and the model was well specified. Three tests were conducted in this study. These were Granger Causality test, cointergration test and Error correction model. The results were as follows;

Granger Causality Test

The results in annex 1 revealed that there was unidirectional relationship running from economic growth to manufacturing growth. However, dummy for unification of exchange rates was found to granger cause economic growth though in a one-way direction of causality. Likewise, manufacturing growth and exports were found to granger cause the dummy for unification of exchange rates. It was also found that exports and employment growth do not granger cause economic growth. However, economic growth was found not granger cause neither employment nor growth exports. This implies that there exists unidirectional causality running from economic growth to manufacturing growth, exports to manufacturing growth and exchange rates.

Impulse Response Functions

Figure 3 presents the impulse response functions of the log of first difference of the variables (Economic growth, manufacturing growth, export growth and employment growth) to one standard deviation structural shocks. The figure includes point of estimation of impulse response functions as well as lower and upper bounds for a 95% confidence interval. From the figure it is seen that the response of employment growth and exports started by causing deviations between short run equilibrium values after unanticipated increases in exports and manufacturing growth respective. Stabilization occurred afterwards. Unexpected shocks of economic growth to manufacturing growth, economic growth to exports, economic growth to manufacturing growth, manufacturing growth to employment growth and manufacturing growth to export had stable relationships.

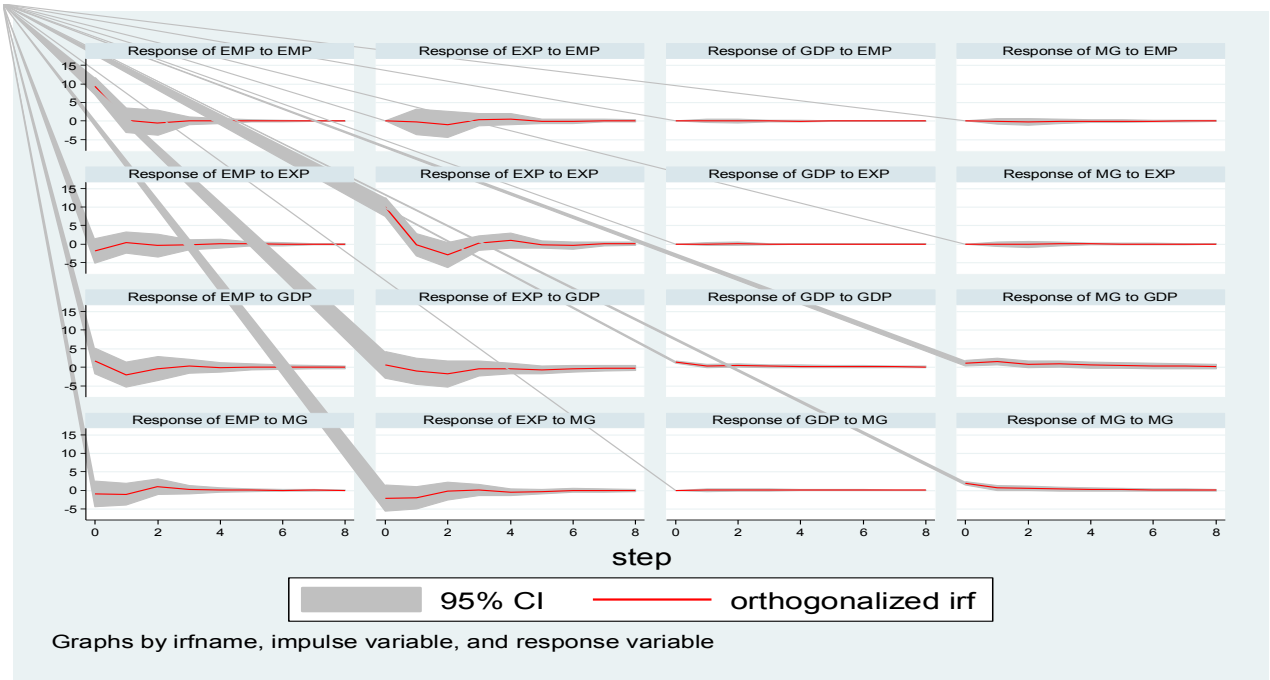

Figure 3: Impulse Response Functions

Co-integration Tests

This test was used to find out co-integrating vector in the model. Table 3 indicates the co-integration test results.

Table 3: Johansen Co-integration Results

Hypothesized Equations	Eigenvalue	Trace Statistic	5% Critical values
None*	-	75.4142	47.21
At Most 1*	0.72161	35.7737	29.68
At Most 2	0.44186	17.6964**	16.41
At Most 3	0.36815	3.4642	3.26
At Most 4	0.10573	2.3469	

Trend: constant, Number of obs = 31, Sample: 1987 - 2017, Lags = 2
Note: Two (2) co-integrating equations are shown at the 5% significant level. *signify rejection of the null

The results in table 3 reveals that economic growth, manufacturing growth, exports and employment were co-integrated as there were two co-integrating vectors. This implies that vector error correction model could be run to explain the existing long run relationship among the variables.

Error Correction Model (ECM)

The error correction term in table 4 indicates that the speed of adjustment was approximately 11.7% from the short run equilibrium to the long run equilibrium. The results show that the coefficient of the error correction term denoted as ECM(_ce1)) was statistically insignificant. This implies that manufacturing sector growth overtime and exports tended to converge towards equilibrium with economic growth in the long run.

Table 4: Error Correction Model

Variable	Coefficient	z	P>|z|
ECM (_ce1)	-0.116519	-0.89	0.091
D_GDP	-0.3184905	-1.68	0.052
D_MG	-0.0579744	-0.55	0.041
D_EXP	-0.0207286	-0.92	0.059
D_EMP	-0.0026636	-0.12	0.908
Constant term	0.0709379		

Dependent Variable: GDP, Number of obs = 31, Log likelihood = -360.836

Concluding Remarks

The study results through the Granger causality test confirms that it is economic growth that causes manufacturing growth and not manufacturing growth that drives the economy. Intuitively this is against the Kaldor's first law for the case of the Tanzanian economy since there exists a unidirection of causation between manufacturing and economic growth as it runs from economic growth to manufacturing growth. This implies that manufacturing growth is not growing at the pace large enough to drive the economy at a pace that can largely impact growth significantly. This suggests that there is a need to increase and sustain investments in manufacture sector so as to propel manufacturing growth and its share in the growth of the economy to higher levels. This implies that manufacturing sector growth will have ripple multiplier effects in the economy in terms of its share to manufactured exports, gross domestic product, employment generation and overall welfare in the economy. This in turn will ensure that manufacturing growth becomes the engine of the economy and be able to drive growth of the economy. To this end, Tanzania should encourage income and employment manufacturing generating activities for growth and sustainability of its economy.

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Annex 1: Granger Causality Results

Null Hypothesis	chi2	[Prob > chi2]
MG does not Granger cause GDP	6.7369	[0.127]
EXP does not Granger cause GDP	0.09838	[0.143]
EMP does not Granger cause GDP	0.14025	[0.231]
DU93 does not Granger cause GDP	6.2651	[0.012]*
GDP does not Granger cause MG	8.3347	[0.004]*
EXP does not Granger cause MG	0.33318	[0.564]
EMP does not Granger cause MG	0.00062	[0.980]
DU93 does not Granger cause MG	3.262	[0.071]
GDP does not Granger cause EXP	0.10465	[0.746]
MG does not Granger cause EXP	2.1133	[0.146]
EMP does not Granger cause EXP	0.02968	[0.863]
DU93 does not Granger cause EXP	3.4072	[0.065]
GDP does not Granger cause EMP	0.64852	[0.421]
MG does not Granger cause EMP	0.16342	[0.686]
EXP does not Granger cause EMP	0.04297	[0.836]
DU93 does not Granger cause EMP	0.50201	[0.479]
GDP does not Granger cause DU93	2.8462	[0.092]
MG does not Granger cause DU93	3.8621	[0.049]*
EXP does not Granger cause DU93	3.5687	[0.059]*
EMP does not Granger cause DU93	0.16005	[0.689]

Note: * is statistical significance at a five percent (5%) level of significance.