Lugina *et al. Future Business Journal* 2022, **8**(1):62
https://doi.org/10.1186/s43093-022-00177-x

Future Business Journal

RESEARCH

Open Access

Effects of industrialization on Tanzania's economic growth: a case of manufacturing sector

Eunice Jonathan Lugina[1], Adam Beni Swebe Mwakalobo[2] and Francis Lwesya[3*]

Abstract

This article examines the impact of industrialization on economic growth in Tanzania focusing on the drivers of structural changes in the manufacturing sector. We apply the vector error correction model based on a parsimonious model covering the period from 1970 to 2017. Our results demonstrate the existence of a positive relationship between the manufacturing sector through its value added and economic growth in Tanzania. We have also observed a similar pattern of relationship in other sectors of the economy such as construction, agriculture, and services. Furthermore, the interaction model shows that foreign direct investment inflows and net domestic credit are the drivers of manufacturing growth. However, the real exchange rate coefficient is negative and significant, suggesting that it has had a negative impact on manufacturing output. The results are consistent with postulations of economic models found in economic growth theories. The article also presents some policy implications regarding the need for consistent policy implementation in the manufacturing sector and further improvement of the investment climate.

Keywords: Industrialization, Economic growth, Manufacturing sector, Parsimonious model

Introduction

Over the past three decades, policymakers, economists and development researchers have championed structural economic transformation as a key channel to accelerate economic growth and reduce poverty in Africa. The focus has been on promoting structural change and productivity growth, and industrialization is seen as a key driver of structural change [1–4]. Fox [5] defines transformation as "the movement of resources (factors of production) toward high-productivity activities, both within and between sectors, and is associated with more production in enterprises and less production in households (i.e., more wage employment and less self-employment)". Economic transformation is essential to improve the quality of growth so that it is broad-based, resilient to shocks and provides opportunities for further growth.

Earlier literature also alludes to the importance of industrialization in the process of economic transformation. For example, Kaldor [6] comments that manufacturing offers opportunities for economies of scale that are less available in agriculture or the service sector. Similarly, linkage and spillover effects between manufacturing and other sectors are thought to be stronger in manufacturing than in other sectors [7–10]. Despite the positive role played by industrialization in economic development in the countries of East Asia and Europe, recent statistics indicate a decreasing role of industrialization in economic development in Africa. Africa's economic structure is changing rapidly with an increasing share of service activities, particularly distribution services and the shift in employment share has been toward the service sector [11]. This raises questions about the continued importance of manufacturing sector for economic development [3]. Bhorat et al. [12] reported that

*Correspondence: flwesya@yahoo.com

[3] Department of Business Administration and Management, The University of Dodoma, Dodoma, Tanzania
Full list of author information is available at the end of the article

in Sub-Saharan Africa (SSA), the share of manufacturing in gross domestic product (GDP) stagnated for five consecutive years.

Earlier studies have also linked the deteriorating situation in SSA's manufacturing sector to the post-independence industrialization model, which focused on import substitution policies and protection policies for infant industries. However, more recent studies associate the current situation to trade and globalization policies. The main narrative is that the World Trade Organization (WTO) trade liberalization agenda has exposed emerging manufacturing sectors to global markets and competition, and has prompted some African countries to become importers of cheap Asian manufactured goods [13] 14]. However, given the relatively lower labor costs in African countries, there may be opportunities to attract labor-intensive manufacturing industries from Asia [15]. This optimism is evidenced by the rapid influx of foreign direct investment (FDI) into Africa, where manufacturing accounts for 22 percent of all total FDI. Despite the low performance of manufacturing in SSA, its role in economic growth and transformation is widely recognized, particularly through the creation of direct and indirect jobs in the sector and other production-related services [16], and poverty reduction [17]. The United Nations Industrial Development Organization (UNIDO) and the United Nations Conference on Trade and Development-UNCTAD [18], the Economic Commission for Africa (ECA) and the African Union [17] state that commodity-based industrialization can drive rapid growth and economic transformation in Africa. However, in order to bring about transformative changes through the manufacturing sector, three critical factors must be in place: "the ability to sustain the growth of the sector over extended uninterrupted periods" [19], "competitiveness" [20] and "enabling policies" [21].

Like other African countries, Tanzania has taken various measures to boost investment, growth, and productivity in the manufacturing sector. These measures include improving business conditions and macroeconomic stability policies, improving infrastructure and services, attracting foreign direct investment (FDI), and introducing Special Economic Zones (SEZ) and Export Processing Zones (EPZ) [22]. However, Tanzania is facing a similar situation to other African countries, where the share of manufacturing in GDP is declining and the service sector is taking the lead. The share of manufacturing in GDP rose slightly from 6.2 percent in 2006 to 6.8 percent in 2015 [23]. Volatility has characterized the sector over the years, resulting in a low proportion of manufacturing job opportunities [24]. Similarly, it was found that in 2010 only 2.7 percent of Tanzanian workers were employed in manufacturing, compared to 12 to 14 percent of workers in other countries with the same per capita income as Tanzania and the labor force share in manufacturing in a middle-income country was ten times higher than Tanzania [25].

These factors therefore raise the question of what role industrialization plays in economic growth in Tanzania, considering that manufacturing can be one of the productive sectors that has the potential to absorb a relatively large number of modestly skilled workers and has strong links to other sectors such as agriculture, construction, and services. Furthermore, Tanzania's strategic position and active role in the regional blocs of East African Community (EAC) and Southern Africa Development Community (SADC) mean a larger market base for industrial sector development. Therefore, this article helps to understand the role of industrialization in Tanzania's economic growth and uncovers some of the drivers of manufacturing sector growth from 1970 to 2017. The specific goals were:

- assess the sectoral effects on economic growth in Tanzania
- examine the drivers of manufacturing sector performance in Tanzania
- assess the relationship between manufacturing sector and economic growth in Tanzania

The remaining sections are structured as follows: "Literature review" section is devoted to literature review. "Data and research methodology" section describes the data sources and research methodology used. "Results and discussion" section presents results and discussion. "Conclusion and policy implication" section presents conclusions and implications for research.

Literature review

Theoretical literature review

Kaldorian theory of economic growth

The theory was formulated in 1957 and explained growth in terms of its relationship with manufacturing. During the post-war period, Kaldor wrote that the link between economic growth and overall output growth was essential to the growth trajectory of developed economies [26]. Kaldor's inductive approach has three laws. First, it states that there is a strong relationship between economic growth (GDP) and manufacturing output growth. Kaldor showed his evidence through his regression $[g_{GDP} = a_1 + b_1 + g_m]$ where by g_{GDP} means output growth and g_m means the manufacturing output growth. Kaldor also claimed that growth in non-manufacturing output also responds to growth in manufacturing output. This Kaldorian first law equation implied that output was subject to increasing returns to scale, services depended on finished goods, and most exports came from finished goods. The second is Verdoorn's law, which states that faster output growth accelerates productivity growth. It turns out that the growth in labor productivity in manufacturing and the growth in output have a strong positive significant correlation between them, the larger the increase in productivity gains throughout the system chain, leading to a decrease in unit labor costs and eventually to a reduction of the price level. This in turn will increase countries' competitiveness, leading to further production growth through increased exports [27]. The third law is the two-sector model (industrial and agricultural sector relationship). This law states that non-manufacturing productivity growth and manufacturing output growth have a strong positive relationship. In addition, the law speaks of a veiled assumption of unemployment in the economy. (During the initial phase in agriculture and consequently in services), in which combined with the rigid wage hypothesis in industry is higher than agricultural wages and thus leads to an elastic labor supply for industry. The main thrust of the law is that the non-industrial sector is characterized by diminishing returns to scale as resources are shifted to the industrial sector and the average productivity of the remaining sectors will increase [26].

Big push theory

This theory was introduced by Rosenstein-Rodan [28] with the aim of getting the small non-industrialized countries to expand their domestic markets. Lack of markets is the major obstacle to industrialization in third world countries due to limited population and low sufficient demand due to low per capita income and uneven income distribution within these countries. In addition, high tariffs and additional barriers such as competition from developed countries in exporting their manufactured products are the challenges faced by non-industrialized countries. As such, Rosenstein-Rodan [28] said "there is a minimum level of resources that must be devoted to a development programme if it is to have any chance of success. Leading a country toward self-sustaining growth is a bit like taking off a plane. There is a critical groundspeed that must be exceeded before the vehicle can become airborne, the bit by bit in its effects not adding to the sum of the individual bits. A minimum investment amount is necessary but not sufficient condition for success. According to him, each sector can take advantage of having economic size to overcome the market constraint as a source of demand for products from other sectors. Therefore, both sectors and individual companies will benefit from production.

Empirical literature review

There is empirical evidence for the existence of a link between industrialization (manufacturing industry) and economic growth in countries of East Asia, America, Europe and some African countries. Kapoor [29] study on creating jobs in India's organized manufacturing sector found that despite economic growth fueled by manufacturing growth, restrictive product market regulations and infrastructure bottlenecks negatively impacted manufacturing sector performance. Herman [30] also assessed the importance of manufacturing in the Romanian economy after Romania had been undergoing deindustrialization for over two decades. The results show that the intensity of the deindustrialization process decreased, allowing manufacturing to remain the backbone of Romanian industry and the economy as a whole. This view is supported by the study of Su and Yao [31], who examined the role of manufacturing during the middle-income development phase and found that in the middle-income phase, manufacturing pulls along with all other sectors, including the service sector, continues to be the main driver of economic growth for middle-income economies. A similar observation was made in Attiah [32] study examining the role of manufacturing and service sectors in economic growth in developing countries. The results show that the share of manufacturing in GDP is positively related to economic growth and that this effect is more pronounced for poorer countries when such effects are not found for services.

In the African context, Moyo and Jeke [33] examined the relationship between manufacturing and economic growth in 37 selected African countries. The results show that manufacturing value has a positive impact on economic growth in African countries. It is recommended that policy makers take action to increase production output. Similarly, Olamade and Oni [2] examined the importance of manufacturing for economic growth in 28 African countries. Their study concluded that manufacturing is the engine of growth in Africa. A similar conclusion was drawn in a study by Opoku and Yan [34] on industrialization as a driver of sustainable economic growth in 37 African countries, that industrialization is a major driver of economic growth and that trade openness further amplifies the impact of industrialization on economic growth. On the other hand, Mijiyawa [35] study on drivers of structural transformation in manufacturing sector in 53 African countries, found a U-shaped relationship between the manufacturing share of GDP and per capita GDP, implying that industrialization would not automatically lead to increase in income unless the underlying barriers to manufacturing development are addressed.

In Tanzanian context, the manufacturing sector has continued to receive policy support despite its small contribution to GDP. This includes various policies, strategies and frameworks. This includes the adoption of Vision 2025 in 1999, which aims at industrial development as a key sector to lead the country to a diversified and semi-industrialized economy by 2025. In addition, the adoption of the Tanzania Five-Year Development Plans I and II (2011/2012–2015/2016 and 2016/17–2020/21). These plans also include industrialization among the core priorities of Tanzania's plans, with an emphasis on boosting manufacturing and export-led growth. Operational goals were to promote the share of manufacturing industry in GDP, to improve the value added of agricultural products and to promote the export of finished products (TFYDP I, p.71) and FYDP II with the aim of transforming Tanzania into a semi-industrialized country 2025. However, regarding the performance of the manufacturing sector, a study by Wangwe et al. [36] on Tanzania's manufacturing performance: challenges and the way forward show that the manufacturing sector remains largely undiversified and vulnerable to fluctuations in agricultural output and commodity prices. The most dynamic sub-sectors are food, plastics and rubber, chemicals, basic metalwork and non-metallic mineral products. Nonetheless, domestic value added is limited by dependence on imported intermediates, indicating limited cross-industry links important for boosting the domestic manufacturing base and employment. A similar observation was made by Page and Trap [37] in his study on industry in Tanzania: performance, prospects, and public policy found that Tanzania suffers from a 'manufacturing deficit' and suggested using special economic zones, improving trade logistics and enacting reforms programmes for micro and small businesses. Mbelle [25] also alluded to slower employment growth in manufacturing compared to other sectors over the years and commented on likely premature deindustrialization. Therefore, in this study, we propose the following hypotheses:

(a) Hypothesis 1 (H_1): There is a significant positive effect of Industrialization on Tanzania's economic growth.
(b) Hypothesis 2 (H_2(a)): Foreign direct investment inflows, net domestic credit and labor force have a positive significant effect on the growth of manufactured value added in Tanzania.
Hypothesis 2 (H_2(b)): The real exchange rate has a negative significant effect on manufactured value added in Tanzania
(c) Hypothesis 3 (H_3): Economic sectors have a positive impact on economic growth in Tanzania.

Data and research methodology

This study uses time series data from 1970 to 2017 to analyze the impact of industrialization (manufacturing) on Tanzania's economic growth. The data sources used in this study are the National Bureau of Statistics (NBS), the International Monetary Fund (IMF), the World Bank and the Bank of Tanzania (BOT).

The model

The study uses the Vector Autoregressive model (VAR) to analyze the effect of manufacturing sector on economic growth in Tanzania. We run two models of assessment:

The first model assesses the sectoral effect on economic growth in Tanzania. The model is expressed as follows:

$$GDPN = f(MANU, AGRC, CNST, SERC, MINQ, WSSE) \quad (1)$$

where $GDPN$ = Gross Domestic Product (millions of shillings); $MANU$ = Share of manufacturing sector in GDP (millions of shillings); $AGRC$ = Share of agriculture sector in GDP (millions of shillings); $CNST$ = share of construction sector in GDP (millions of shillings); $SERC$ = share of service sector in GDP (millions of shillings); $MINQ$ = share of mining and quarrying sector in GDP (millions of shillings); $WSSE$ = share of Water supply and electricity sector in GDP (millions of shillings).

Econometric model

$$\ln GDPN_t = \beta_o + \beta_1 \ln MANU_t + \beta_2 \ln AGRC_t + \beta_3 \ln CNST_t + \beta_4 \ln SERC_t + \beta_5 \ln MINQ_t + \beta_6 \ln WSSE_t + \varepsilon_t \quad (2)$$

The second model analyzes the factors affecting manufactured value-added growth from 1970 to 2017 is expressed as:

$$MVA = f(FDI, XRT, NDC, LFO) \quad (3)$$

where MVA = Manufacturing value added (Million Shillings); FDI = Foreign direct investments inflows in USD (Equivalent in million Shillings); XRT = Exchange rate in percentage; NDC = Net domestic credit (million shillings); LFO = Labor force as a percentage of the population.

In econometric form is expressed as:

$$\ln MVA_t = \alpha_o + \alpha_1 \ln FDI_t + \alpha_2 \ln XRT_t + \alpha_3 \ln NDC_t + \alpha_4 \ln LFO_t + \mu_t \quad (4)$$

Estimation techniques

A stationarity test was performed using the Augmented Dickey-Fuller (ADF) unit root test. ADF was used to check if each data series has unit root in order to avoid spurious regression. The test is performed to establish the integration order of variables. The integration test is followed by the cointegration test. In the literature, the existence of a long-term (stationary) equilibrium relationship between the economic variables is referred to as cointegration. To investigate the existence of cointegration (long-term relationship) between the variables, the Engle-Granger test of cointegration was applied. A cointegration analysis tests whether there is a long-term or equilibrium relationship between two or more variables. The Error Correction Model (ECM) was used to capture the short-term and long-term dynamic effects. The dynamics affecting the short-run relationship between manufacturing sector growth and economic growth are captured by differenced variables, while the lagged error term (ec_{t-1}) captures the long-run dynamics of the manufacturing sector and economic growth. The error term (ec_{t-1}) is estimated in Eqs. (5 and 6). In addition, the diagnostic tests were performed on Parsimonious models; Autocorrelation test with the Breusch–Godfrey LM tests, multicollinearity test with the VIF method and heteroscedasticity test with the Breusch–Pagan test. After these tests, the final parsimonious models were used to obtain the estimation results.

Results and discussion

Distribution of data

The normality test was performed to assess whether the data used in the study from the period 1970 to 2017 are normally distributed. As a preliminary test, the distribution of the data was found to be normally distributed. However, this was not a sufficient condition until the variables were transformed by introducing the logarithmic form to reduce the non-normality properties. In addition, the descriptive statistics in Table 1 suggest that the data is normally distributed.

Correlation test

The results of the correlation analysis are shown in Table 2 and show that all variables are strongly positively correlated in the range of 0.6347 to 0.9969. Descriptive statistics also show that the variables are normally distributed.

Unit root test (stationarity)

The Augmented Dickey Fuller (ADF) was applied to test for the stationarity of data. Each variable was tested for the stationarity by adding the lagged values

$$
\begin{aligned}
\triangleright LGNPNt = \beta 0 + \beta 1t \sum_{i=1}^{k} \triangleright LGDPNt - 1 + \beta 2t \sum_{i=0}^{k} \triangleright LMANUt - 1 + \beta 3t \sum_{i=0}^{k} \triangleright LMINQt - 1 + \beta 4t \sum_{i=0}^{k} \triangleright LCNSTt - 1 \\
+ \beta 5t \sum_{i=0}^{k} \triangleright LWSSEt - 1 + \beta 6t \sum_{i=0}^{k} \triangleright LAGRCt - 1 + \beta 7t \sum_{i=0}^{k} \triangleright LSERCt - 1 + \lambda 1tECT + \mu t
\end{aligned} \tag{5}
$$

$$
\begin{aligned}
\Delta LMVA_t = \infty_0 + \infty_{1i} \sum_{i=1}^{k} \Delta LMVA_{t-1} + \infty_{2i} \sum_{i=0}^{k} \Delta LFDI_{t-i} + \infty_{3i} \sum_{i=0}^{k} \Delta LXRT_{t-i} \\
+ \infty_{4i} \sum_{i=0}^{k} \Delta LNDC_{t-i} + \infty_{5i} \sum_{i=0}^{k} FO_{t-1} + \lambda_t
\end{aligned} \tag{6}
$$

Table 1 Descriptive Statistics Results

ITEM	LGDPN	LMANU	LMINQ	LCNST	LWSSE	LAGRC	LSERC	LMVA	LFDI	LXRT	LNDC	LLFO
Mean	13.865	11.235	9.441	10.810	9.1365	12.825	12.213	6.8993	17.8624	5.0472	12.5020	3.9497
Maximum	18.569	15.669	15.533	16.673	13.2717	16.975	17.855	7.9982	21.4591	7.7092	16.8548	3.9722
Minimum	9.015	6.722	3.7384	5.999	3.0469	8.125	5.3479	5.6325	9.2103	1.9489	7.4674	3.9320
Standard Dev	3.125	2.9821	3.919	3.409	3.0252	2.834	3.9347	0.5802	3.0021	2.2360	2.7852	0.0134
Skewness	0.0982	0.0189	0.0412	0.0528	0.3903	0.200	0.0577	0.8605	0.0082	0.2546	0.5947	0.9271
Kurtosis	1.5688	1.4714	1.463	1.5903	1.7028	1.703	1.4361	0.6639	0.1254	0.0000	0.0140	0.0000
Jarque–Bera	0.22	0.35	0.84	0.78	0.87	0.56	0.88	0.32	0.76	0.89	0.78	0.45

Source: Data analysis

Table 2 Correlation analysis results

Variables	LGDPN	LMANU	LMINQ	LCNST	LWSSE	LAGRC	LSERC
LGDPN	1						
LMANU	0.9948	1					
LMINQ	0.9912	0.9895	1				
LCNST	0.9924	0.9899	0.9917	1			
LWSSE	0.9717	0.9542	0.9526	0.9569	1		
LAGRC	0.9969	0.9872	0.9826	0.9858	0.9730	1	
LSERC	0.9867	0.9884	0.9866	0.9829	0.9528	0.9752	1
	LMVA	**LFDI**	**LXRT**	**LNDC**	**LLFO**		
LMVA	1						
LFDI	0.6908	1					
LXRT	0.6347	0.6881	1				
LNDC	0.8045	0.7052	0.9533	1			
LLFO	0.6657	0.7895	0.9503	0.9045	1.0000		

Source: Data analysis

to the variables and to ensure that the remaining error term is white noise (Gujarati 2003). The unit root test results are presented in Table 3. The results show that initially all variables are non-stationary at all significance levels (0.1, 0.05 and 0.01) in both lag (1) and lag (2). After differencing the variables, all independent variables became stationarity at 1 percent level of significance with lag (1) while, the dependent variable (LGDPN) become stationary at 5 percent level of significance with lag (1). This means that, all variables in the model are integrated in order of one [I (1)]. Also, the unit root test was performed for variables of the second equation, variable (LFDI) is stationary at lag (1) at a significance level of 0.1, and other variables became stationary after differencing at one percent level of significance except dLLFO which became at 5% level of

Table 3 Unit root test results

Variable	ADF test (*p*-value)		Difference variables	ADF test (*p*-value)	Order of integration
	Lag 1	**Lag 2**		**At 1st Difference**	
LGDPN	0.8522	0.7810	dLGDPN	0.0115**	I(1)
LMANU	0.9113	0.9005	dLMANU	0.0038***	I(1)
LMINQ	0.9854	0.9689	dLMINQ	0.0002***	I(1)
LCNST	0.9853	0.9903	dLCNST	0.0000***	I(1)
LWSSE	0.8000	0.7839	dLWSSE	0.0000***	I(1)
LAGRC	0.4677	0.3706	dLAGRC	0.0003***	I(1)
LSERC	0.9165	0.9265	dLSERC	0.0000***	I(1)

Variables	AD Test (*p*-value)		Difference variables	ADF test (*p*-value)		Drifting	Order of Integration
	Lag 1	**Lag 2**		**Lag 1**	**Lag 2**		
LMVA	0.03929	0.5253	dLMVA	0.0010***			I(1)
LFDI	0.4311	0.0738	dLFDI	0.0000***			I(1)
LXRT	0.6884	0.6305	dLXRT	0.1714	0.308	0.0052***	I(1) Drift
LNDC	0.6550	0.5412	dLNDC	0.0002***			I(1)
LLFO	0.9639	0.9656	dLLFO	0.0200**			I(1)

(i) McKinnon (1980) critical values are used for rejection of the null hypothesis of the Unit Root. i.e., *, ** and, *** indicate rejection of null hypothesis of the Unit root at 10%, 5% and 1% levels of significance respectively

(ii) ADF stands for Augmented Dickey Fuller

Table 4 Cointegration analysis results

Series: LGDPN, LMANU, LMINQ, LCNST, LWSSE, LAGRC, LSERC *Lag Interval (1)* *Number of Observation 46* *Sample:1970 – 2017*		
Regression	ADF statistic (*p*-value)	Order of Integration
Residual	−3.701 (0.0041) ***	I (0)
Series: LMVA, LFDI, LXRT, LNDC, LLFO *Lag Interval (1)* *Number of Observation 46* *Sample:1970 – 2017*		
Regression	ADF-Statistic (*p*-value)	Order of Integration
Residual	−3.041 (0.0312) **	I (1)

Asterisk ***, ** indicates significance level at 1% and 5%

Table 5 Granger causality Wald test

Equation	Excluded	Chi^2	Df	Prob > Chi^2
LGDPN	LMANU	18.32	2	0.000
LGDPN	ALL	18.32	2	0.000
LMANU	LGDPN	26.442	2	0.000
LMANU	All	26.442	2	0.000

significance. In addition, dLXRT became stationary after drifting to a one percent level of significance.

Cointegration analysis

The cointegration test was used to determine the existence of a long-term relationship between variables using the two-stage procedure of Engle-Granger [38]. The results of the cointegrating regressions are present in Table 4. The results show that there is a long-run relationship between variables where the residual is significant at the 1% level and has a probability value of 0.0041, implying that the residual is stationary. Since the residual is stationary, there is a long-run relationship of the variables (cointegration) in the model. Similarly, the test results in Model 2 show that the variables have a long-term relationship because the residual is significant at the 5 percent level and has the probability value of 0.0312.

Granger causality analysis

In addition to the cointegration test, we performed the granger causality test to determine the direction of causality between nominal gross domestic product and the contribution of manufacturing sector. For this case, the Vector-Granger causality model in autoregression (VAR) was used. The results show that the null hypotheses were rejected. This means that there is bi-directional causality between LMANU and LGDPN variables (Table 5).

Table 6 Estimated results for parsimonious model of DLGDPN

Included Observations: 28 after adjusting endpoints **Dependent var. = *DLGDPN***				
Variable	**Coefficient**	**Std. Err**	**t-Statistic**	**Prob**
DLGDPN_1	0.2133563	0.0837936	2.55	0.015**
DLMANU	0.3694001	0.0531208	6.95	0.0000****
DLWSSE	0.0434852	0.0185296	2.35	0.024**
DLAGRC	0.0504165	0.016262	3.10	0.004***
DLSERC	0.3166955	0.0915771	3.46	0.001***
ECT_1	−0.63784	0.1323471	−4.82	0.0000***
_CONS	−0.0000788	0.0244227	−0.00	0.997
R-Squared	0.7943			
Adjusted R-Squared	0.7564			
Sum Squared Residual	0.1412			
F-test (prob.)	20.96 (0.000)			
Breusch–Godfrey LM Test	0.398 (0.5283)			

Where, *, ** and, *** indicate statistical significance levels at 10, 5 and 1 percent respectively

Error correction model (ECM)

After establishing that there is a relationship between GDPN and independent variables as well as LMVA and independent variables, we developed the ECM. The goal was to capture the short-run dynamic effects and to identify the speed of adjustments to the long-run equilibrium. In applying the vector error correction model (VECM) we dropped some insignificant variables such as DLWSSE_1, DLSERC_1, DLMINQ_1, LMINQ, DLAGRC_1, DLCNST_1 and DLMANU_1 from the over-parameterized model, the parsimonious model of DLGDPN is generated in Table 6.

Table 7 Estimated results for parsimonious model of DLMVA

Included observation = 38
Dependent variable: DLMVA

Variable	Coefficient	Standard error	t-statistic	Prob
DLMVA_1	0.3701201	0.1652655	2.24	0.032**
DLFDI	0.0217918	0.0114891	1.90	0.067*
DLXRT	−0.9437638	0.2421889	−3.90	0.000***
DLXRT_1	0.6852111	0.2458262	2.79	0.009***
DLNDC	0.1354041	0.1050987	1.29	0.027**
ECT_1	−0.2722977	0.1299611	−2.10	0.044**
_CONS	0.0294553	0.0302243	0.97	0.337
R-Squared	0.4278			
Adj. R-Squared	0.3170			
Sum Squared Residual	0.6023			
F-test (Prob.)	0.0023			

*, ** and, *** indicate statistical significance levels at 10, 5 and 1 percent respectively

Table 8 Multicollinearity test results

Variable	VIF	1/VIF
DLGDPN	–	–
DLGDPN_L1	1.32	0.759974
RES	–	–
RES_L1	1.24	0.809306
DLCNST	1.21	0.826420
DLMANU	1.20	0.836801
DLAGRC	1.16	0.865320
DLSERC	1.14	0.874056
DLWSSE	1.07	0.930676
Mean VIF	1.19	

Similarly, we applied Vector Error Correction Model (VECM) to capture the relationship between LMVA and independent variables. We dropped DLXRT_2, DLLFO_1, DLNDC_1 and DLLFO from the over-parameterized model and developed the parsimonious model of DLMVA, the results of the parsimonious model are in Table 7.

Diagnostic tests for the parsimonious models

Before economic interpretation of the results, diagnostic tests were performed in the parsimonious models. A regression results in the preferred model (Table 7) shows that the F-statistic with the probability value of 0.000 is significant at all levels. In addition, Table 8 shows that the F statistic has a p-value 0.0023 which is significant at all levels. This implies a rejection of the null hypothesis that all the variables on the right-hand side except the constant have zero parameter coefficients. The Breusch–Godfrey LM tests for serial correlation shows the validity of the both models. The parsimonious model of LGDPN goodness of fit results show that the regressors in the model explains about 79.4 percent of the fluctuations in domestic product growth over the period 1970–2017. In addition, the parsimonious model of LMVA shows that 42.7 percent of the variations in the independent variables explains the variations in manufacturing sector value added.

Table 9 Multicollinearity test results

Variable	VIF	1/VIF
DLMVA	–	–
DLMVA_1	1.56	0.641503
DLXRT_1	2.68	0.373702
RES	–	–
RES_L1	1.95	0.512650
DLNDC	1.43	0.699815
DLFDI	1.29	0.774001
Mean VIF	1.83	

Table 10 Heteroscedasticity test results

Breusch–Pagan/Cook Weinsberg test for heteroskedasticity
Ho: constant variance
Variables: fitted values of DLGDPN

Chi^2 (1) = 21.78

Prob > chi2 = 0.0000

Breusch–Pagan /Cook Weinsberg test for heteroskedasticity
Ho: constant variance
Variables: fitted values of DLMVA

Chi^2 (1) = 0.06

Prob > chi2 = 0.8081

Multicollinearity

The study performed a multicollinearity analysis to test whether independent variables in the regression models were correlated.

The results show that, the degree of correlation has minimized in the models (Tables 8 and 9) that resulted to have mean Variance Inflation Factor (VIF) equal to 1.19 and 1.83 respectively which is less than 10. This means that, there is no multicollinearity problem in the models (Table 10).

Heteroscedasticity test

The test is performed to find out whether all independent variables have the constant variance. The heteroscedasticity test uses the standard errors obtained from the regression results of the parsimonious models. The Breusch–Pagan heteroscedasticity test indicates that there is heteroscedasticity in the model for DLGDPN and because the probability value of the Chi^2 statistic is less than 0.05. Therefore, the null hypothesis of homoscedasticity can be rejected at a significance level of 5 percent. Furthermore, there is no heteroscedasticity in the model for DLMVA since the p-value is 0.8081 and the null hypothesis is accepted at all significance levels. Therefore, to remove bias in the test results and in the confidence interval in the DLGDPN model, the robust standard errors were used to correct for the error. Then, the parsimonious model after correction for heteroscedasticity is shown in Table 11.

With regard to the diagnostic test carried out in the model, it can be seen that the basic statistical requirements are largely met and therefore no serious weaknesses were identified.

Table 11 Parsimonious model after correction of heteroscedasticity

Variable	Coefficients	Robust standard error	t-Statistics	Prob
Number of Observation = 46 F (7,38) = 11.81 Prob > F = 0.0000 R-squared = 79.43 Root MSE = 0.06096				
Dependent Variable: DLGDPN				
DLGDPN_1	0.2133563	0.0665216	3.21	0.003***
DLMANU	0.3694001	0.1039849	3.55	0.001***
DLCNST	0.0434852	0.0161013	2.70	0.010**
DLWSSE	0.0504165	0.0155633	3.26	0.002***
DLAGRC	0.3166955	0.1138787	2.78	0.008***
DLSERC	0.0476301	0.0260578	1.83	0.075*
Res_1	−0.63784	0.1903022	−3.35	0.002***
-CONS	−0.0000788	0.0232256	−0.00	0.997

*, ** and, *** indicate statistical significance levels at 10, 5 and 1 percent respectively

Discussion of the results

The results show that industrialization (manufacturing sector) has a positive and significant effect on economic growth in Tanzania. The results suggest that despite slow growth, manufacturing remains an important sector for boosting economic growth in Tanzania. This result is consistent with what has been found in other developing and African countries [2, 31–35]. However, most studies in Africa recommend that strengthening institutional quality, adopting appropriate industrial policies, technologies, and innovations, increasing trade openness, attracting FDIs and developing infrastructure can remove some of the barriers to manufacturing sector development.

Regarding the factors influencing the growth of manufacturing sector in Tanzania. The results show that output growth is driven by foreign direct investment and domestic net credit. These results are consistent with Alfaro et al. [39] who found that FDI has the potential to create links with domestic industries that drive manufacturing development. However, the exchange rate (XRT) is statistically significant (0.000), which represents the rejection of the null hypothesis and indicates that the exchange rate has an impact on output growth as there is a negative relationship between them. This means that a one percent increase in the exchange rate results in a decrease in output growth of about 0.943. This is in line with a study by Mlambo [40] who indicated that the exchange rate has a negative impact on production output as it increases production costs and thus reduces production growth. In addition, the net domestic credit (NDC) is statistically significant at 5% (0.027), indicating that the null hypothesis is rejected. This means that for a 1% increase in net domestic credit, output growth increases by 0.1354. This finding confirms a survey conducted in Nigeria, which showed that many emerging manufacturing companies agreed that the increase in their production and sales was due to access to credit opportunities that arose after financial sector liberalization [41].

Regarding the relationship between manufacturing and economic growth. The results show the existence of a positive and significant relationship between the variables. This means that manufacturing drives economic growth by increasing its share of production as it is the most productive sector of the economy and a source of exports, creating employment opportunities which in turn fuel economic growth [21]. A Study by Szirmai et al. [42] has shown that manufacturing is the engine of economic growth in developing countries. On the other hand, economic growth also accelerates manufacturing growth by promoting new technologies and innovations, by attracting foreign direct investment and by the government providing favorable infrastructure for running manufacturing activities.

Analyzing the effect of economic sectors on economic growth, the parsimonious model (after correcting for heteroscedasticity) shows that GDP has grown at a significant level of 1 percent. The construction sector is statistically significant at the 5 percent level (0.0434) indicating rejection of a null hypothesis and a positive relationship with GDP growth. Similarly, water supply and electricity are statistically significant at a significance level of 1 percent (0.002), indicating rejection of the null hypothesis and demonstrating the positive relationship between water supply and electricity and GDP.

The agricultural sector is also statistically significant with a 1 percent significance level of 0.008 (0.316), implying a rejection of the null hypothesis and demonstrating the positive relationship between GDP and the agricultural sector's contribution to GDP. In addition, the services sector is also statistically significant with a significance level of 10 percent (0.075), indicating a rejection of the null hypothesis and showing the positive relationship between the services sector's contribution to GDP and GDP. The study thus shows that economic sectors have a significant impact on economic growth. These results support the findings of Hussin and Yik [44] that manufacturing, agriculture, and the service sector have a positive and significant impact on economic growth in China and Malaysia. Anaman and Egyir [43] also found that the construction sector has a positive significant effect on Ghana's economy.

Conclusion and policy implication

The main objective of this study was to examine the effect of industrialization on Tanzania's economic growth. To achieve the study objective three hypotheses were tested. The first hypothesis (H_1) was there is a significant positive effect of industrialization on Tanzania's economic growth. The study found the existence of a positive relationship between industrialization and economic growth in Tanzania. The second hypothesis 2 (H_2 (a)) was that foreign direct investment inflows, net domestic credit and labor force have a positive significant effect on the growth of manufactured value added in Tanzania. Similarly, hypothesis 2 (H_2 (b)) was the real exchange rate has a negative significant effect on manufactured value added in Tanzania. The study found the positive effect of foreign direct investment inflows and domestic net credit on the value added of manufactured products in Tanzania. In addition, the real exchange rate had a negative impact on value added in Tanzania. The results reject the null hypotheses based on parsimonious model. The third hypothesis (H3) was that economic sectors have a positive impact on economic growth in Tanzania. The results show that water supply and electricity, the construction sector, the agricultural sector, and the service sector had a positive relationship with GDP. Therefore, in order to boost the growth and development of the manufacturing sector and maintain its influence on economic growth, consistent policy implementation in this sector is important, especially improving the business environment through the streamlining of numerous rules and regulations affecting the sector and investment in reliability energy sources and the introduction of macroeconomic stability strategies. In addition, promoting the application of science and technology, facilitating access to finance, and improving infrastructure are some of the key issues to drive the development of manufacturing sector.

Abbreviations

VECM: Vector Error Correction Model; FDI: Foreign Direct Investment; NDC: Net Domestic Credit; SSA: Sub-Saharan Africa; GDP: Gross Domestic Product; UNIDO: The United Nations Industrial Development Organization; UNCTAD: The United Nations Conference on Trade and Development (2011); ECA: Economic Commission for Africa; SEZ: Special Economic Zones; EPZ: Export Processing Zones; EXR: Exchange Rate; MVA: Manufactured Value Added.

Acknowledgements

Not Applicable.

Author contributions

EJL = Writing and data analysis, ABSM = Editing and data interpretation, FL = Review and finalizing the manuscript.

Funding

Not Applicable.

Availability of data and materials

Available.

Declarations

Competing interests

The author declares that they have no competing interests.

Ethics approval and consent to participate

Not Applicable.

Consent for publication

Not Applicable.

Author details

[1]University of Dodoma, Dodoma, Tanzania. [2]Department of Economics and Statistics, The University of Dodoma, Dodoma, Tanzania. [3]Department of Business Administration and Management, The University of Dodoma, Dodoma, Tanzania.

Received: 9 July 2022 Accepted: 28 November 2022
Published: 16 December 2022

References

1. Mercan M, Kızılkaya O, Okde B (2015) Are The Kaldor's laws valid? Panel data analysis under cross section dependency for NIC countries. Procedia Econ Financ 23:140–145
2. Olamade O, Oni O (2016) Manufacturing and economic growth in Africa: A panel test of kaldor's first growth law. J Econ Sustain Dev 7(22):126–140
3. Szirmai A, Verspagen B (2015) Manufacturing and economic growth in developing countries, 1950–2005. Struct Chang Econ Dyn 34:46–59
4. Su D, Yao Y (2016) Manufacturing as the key engine of economic growth for middle-income economies. ADBI Working Paper 573
5. Fox L (2016) Gender, economic transformation and women's empowerment in Tanzania. A discussion paper by ODI's Supporting Economic Transformation (SET)
6. Kaldor N (1967) Strategic factors in economic development. Cornell University Press, Ithaca
7. Cornwall J (1977) Modern capitalism: It's growth and transformation. Martin's Press, New York
8. Guerrieri P, Meliciani V (2005) Technology and international competitiveness: the interdependence between manufacturing and producer services. Struct Chang Econ Dyn 16(4):489–502

9. Hirschman AO (1958) The strategy of economic development. Westview Press, Boulder
10. Park S-H, Chan KS (1989) A cross-country input-output analysis of intersectoral relationships between manufacturing and services and their employment implications. World Dev 17(2):199–212
11. Enache M, Ghani E, O'Connell S (2016) Structural Transformation in Africa: a historical view, Policy Research Working Paper, 7743
12. Bhorat H, Kanbur R, Rooney C, Steenkamp F (2017) Sub-Saharan Africa's manufacturing sector: building complexity. Working Paper Series N° 256, African Development Bank, Abidjan, Côte d'Ivoire
13. Rodrik, D., (2014). An African growth miracle? NBER Working Paper No. 20188. NBER
14. Rodrik D (2016) Premature deindustrialization. J Econ Growth 21(1):1–33
15. Lin JY (2011) From flying geese to leading dragons: new opportunities and strategies for structural transformation in developing countries. The World Bank
16. Dinh HT, Monga C (2013) Light manufacturing in tanzania: a reform agenda for job creation and prosperity. World Bank Publications
17. African Union Commission (AUC) (2014) The Africa We Want. Addis Ababa
18. UNCTAD (2011). Economic Development in Africa Report 2011 Fostering Industrial Development in Africa in the New Global environment, Special Issue, United Nations, Geneva and New York
19. Szirmai A, Naudé W, Alcorta L (2013) Pathways to industrialization in the 21st century. Oxford University Press, Oxford
20. Lall S (2001) Competitiveness, technology and skills. Edward Elgar Publishing Ltd, Cheltenham
21. United Nations Industrial Development Organization, UNIDO (2015) Industrial Development Report 2016. The Role of Technology and Innovation in Inclusive and Sustainable Industrial Development. Vienna
22. Ismail JI, Lwesya F (2021) The influence of foreign direct investment (FDI) inflows on manufactured exports in Tanzania: an autoregressive distributed distributed lag (ARDL) assessment. J Co-oper Bus Stud (JCBS) 6(1):1
23. EAC (2017) EAC Industrial Competitiveness Report 2017: Harnessing the EAC Market to Drive Industrial Competitiveness and Growth. East Africa Community Secretariat, Arusha, Tanzania
24. Page J (2015) Industry in Tanzania performance, prospects and public policy. The Brookings Institution
25. Mbelle A (2016) Manufacturing and transforming in a developing context. Assessing Policy Response in changing policy paradigm-Tanzania
26. Ibbih JM, Gaiya BA (2013) A cross-sectional analysis of industrialization and growth in Africa. Int Res J Arts Soc Sci 2(6):150–167
27. Libanio G (2006) Manufacturing industry and economic growth in Latin America: A Kaldorian approach. Federal University of Minas Gerais, CEDEPLAR, Brazil
28. Rosenstein-Rodan (1943) The problems of industrialization of Eastern and South-Eastern Europe. Econ J 53:1
29. Kapoor R (2015) Creating jobs in India's organised manufacturing sector. Indian J Lab Econ 58:349–375
30. Herman E (2016) The importance of the manufacturing sector in the Romanian Economy. Proc Technol 22:976–983
31. Su D, Yao Y (2017) Manufacturing as the key engine of economic growth for middle-income economies. J Asia Pac Econ 22(1):47–70
32. Attiah E (2019) The role of manufacturing and service sectors in economic growth: an empirical study of developing countries. Eur Res Stud J 22(1):118–124
33. Moyo C, Jeke L (2019) Manufacturing sector and economic growth: a panel study of selected african countries (September 22, 2019). J Bus Econ Rev 4(3):114–130
34. Opoku E, Yan IK (2019) Industrialization as driver of sustainable economic growth in Africa. J Int Trade Econ Dev 28(1):30–56
35. Mijiyawa AG (2017) Drivers of structural transformation: the case of the manufacturing sector in Africa. World Dev 99:141–159
36. Wangwe S, Mmari D, Aikaeli J, Rutatina N, Mboghoina T, Kinyondo A (2014) The Performance of The Manufacturing Sector In Tanzania: Challenges And The Way Forward. WIDER Working Paper 2014/085. Helsinki: UNU-WIDER
37. Page J, Tarp F (2016) The practice of industrial policy: Government–business co-ordination in Africa and East Asia. Oxford University Press, Oxford
38. Engle RF, Granger CWJ (1987) Co-integration and error correction: representation, estimation, and testing. Econometrica 55(2):251–276
39. Alfaro L, Chanda A, Kalemli-Ozcan S, Sayek S (2004) FDI and economic growth: the role of local financial markets. J Int Econ 64(1):89–112
40. Mlambo C (2020) Exchange rate and manufacturing sector performance in SACU states. Cogent Bus Manag 7(1):1787735
41. Ume KE, Obasikene AC, Oleka CD, Nwadike AO, Okoyeuzu C (2017) The relative impact of bank credit on manufacturing sector in Nigeria. Int J Econ Financ Issues 7(2):196
42. Szirmai A, Naude W, Goedhuys M (2011) Entrepreneurship, innovation, and economic development. Oxford University Press, New York
43. Anaman KA, Egyir IS (2019) Economic shocks and the growth of the construction industry in Ghana, Over the 50-Year Period from 1968 to 2017
44. Hussin F, Yik SY (2012) The contribution of economic sectors to economic growth: the cases of China and India. Re Appl Econ 4(4):38–53

Publisher's Note