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The impact of manufacturing sector on economic growth in Tanzania (1990-2024)

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Abstract

The aim of this study was to examine the role of the manufacturing sector in supporting economic growth in Tanzania from 1990-2024. Time series data obtained from both the World Bank, the Bank of Tanzania, the National Bureau of Statistics, and the IMF were used. The Autoregressive Distributed Lag (ARDL) model was applied to estimate both short-term and long-term relationships. Stationarity was tested using the Augmented Dickey-Fuller (ADF) method, while Granger causality tests were used to determine the direction of influence between the variables. The findings suggested that although manufacturing output had increased over time, its long-run impact on economic growth was statistically insignificant. In the short run the funding on manufacturing output showed a negative effect on GDP, which may have been caused by inefficiencies, adjustment costs, or delays in investment returns. The Granger causality test revealed an unidirectional relationship, where manufacturing output helped predict GDP growth, while GDP did not significantly predict changes in manufacturing. The study concluded that manufacturing sector has a potential for economic growth in the country, although the sector has been limited by poor infrastructure, low investment levels, weak productivity, and limited access to finance. It is recommended that more investment in infrastructure, access to credit especially for small and medium-sized enterprises and skills development can support manufacturing value-added growth.

Keywords: Economic growth, Manufacturing sector, ARDL model, and Granger causality, Tanzania

JEL Classification: 01, 014, 016, 025

1. Introduction

The manufacturing sector plays an essential role in the economic development of many countries. It supports job creation, encourages innovation, adds value to natural resources, and helps increase exports (Naudé & Szirmai, 2012). Across the world, especially in developing countries, manufacturing has helped economies grow by moving them from a focus on agriculture toward industrial production. Countries like China, India, Malaysia, and Vietnam have shown how investment in manufacturing and the use of modern technology can lead to higher productivity, improved incomes, and stronger global competitiveness (Szirmai, 2013). These achievements are often linked to digital advancements under what is known as Industry 4.0, which combines automation, data, and smart technologies to improve production (Rahman & Ismail, 2022). However, research findings on the impact of manufacturing on economic growth have not

always been consistent. In countries like Malaysia, the relationship has been strong and positive, but in others such as Romania and Iran, studies have shown only limited or insignificant effects (Chioveanu & Dima, 2019). In Pakistan and parts of Latin America, the link between manufacturing and growth has been found to change depending on the time period and the specific economic conditions under which the studies were carried out (Bernal et al., 2017).

These mixed findings show that the influence of manufacturing sector on economic growth is complex and often depends on a country's internal structures and policy environment. In some countries like Nigeria and Ghana, manufacturing sector has been a positive force for economic growth, especially when supported by policy reforms and stable macroeconomic environments (Oyinlola & Olaifa, 2018). While South Africa struggles with low investment, limited diversification, and skills shortages in the sector (Nchake et al., 2016). Poor infrastructure and weak trade policies across Africa have further slowed industrial progress (Seck et al., 2022). These problems make it difficult for African countries to fully benefit from the potential of manufacturing (Wangwe et al., 2014). The Tanzanian manufacturing sector has been recognized as a potential engine for economic transformation since the country gained independence in 1961 (Silver, 2019). Given the above background, the purpose of this research was to empirically examine how manufacturing output impacted Tanzania's economic growth.

1.1 Statement of the problem

Although Tanzania has made many efforts to promote industrialization through national plans like the Sustainable Industrial Development Policy, Vision 2025, but the manufacturing sector still contributes very little to the country's economic growth, remaining around 8% of GDP for many years (World Bank, 2022). This has been different from countries like China and Malaysia, where manufacturing plays a big role in economic growth and development. Challenges such as poor infrastructure, low investment, outdated technology, and weak links with other sectors continue to limit its growth (Mwinuka & Mwangoka, 2023). Also, previous studies have shown mixed results: with some suggesting a strong positive link between manufacturing and economic growth (Rahman & Ismail, 2022; Nkinga et al., 2017), while others indicating weak link (Chioveanu & Dima, 2019). Research shows that the Tanzanian manufacturing sector has potential for growth, but it faces serious barriers like high production costs and unreliable energy (Kwayu et al., 2018). Therefore, there is a need to examine the real contribution of the manufacturing sector into Tanzania's economic growth quantitatively by means of data analysis. This study is organized as follows: Section 2 presents Literature review, section 3 gives methodology, section 4 discusses empirical results, section 5 Concludes with Recommendations and Policy Implications.

1.2 Objectives

This study will be guided by both the General and the specific objectives as follows:

1.3.1 General Objective

To examine the impact of the manufacturing sector on economic growth in Tanzania from 1990 to 2024.

1.2.1 Specific Objectives

The study will be guided by three specific objectives as follows

i. To analyze the trends and patterns of the Manufacturing sector in Tanzania over the period 1990–2024
ii. To Evaluate the Long-run and Short-run effect of Manufacturing sector on Economic growth of Tanzania.
iii. To determine the direction of causality between Manufacturing sector and economic growth using Granger causality tests.

1.2.2 Research Hypotheses

i. **H_0:** There is no significant trend or pattern in the Manufacturing output in Tanzania over the period 1990–2024.

ii. **H_0:** Manufacturing sector does not have a significant Long-run and Short-run influence on the overall economic growth in Tanzania.
iii. **H_0:** There is no Granger causality between Manufacturing sector and economic growth in Tanzania.

2. Literature review

The manufacturing sector plays an important role in economic development by contributing to gross domestic product (GDP), employment creation, technological advancement, and export expansion. Several economic theories have been developed to explain the role of the manufacturing sector in fostering economic growth. The Kaldorian theory of economic growth (Kaldor, 1957), provides a foundational explanation of the relationship between manufacturing and overall economic expansion. This theory states that economic growth is strongly linked to the performance of the manufacturing sector. That that GDP growth is positively related to manufacturing output growth. Kaldors's second law suggests that the manufacturing sector benefits from increasing returns to scale, leading to enhanced productivity. Its third law implies that as the manufacturing sector expands, it boosts productivity in other sectors of the economy. Mercan et al., (2015) and Olamade and Oni (2016), provide empirical support for Kaldor's laws, particularly in the context of developing countries. This theoretical framework is relevant for understanding Tanzania's push toward industrialization as outlined in its Vision 2025. The industrialization theory underscores the importance of building a strong industrial base as a pathway to economic development. This theory supports the rationale behind Tanzania's industrialization policies, which aim to reduce poverty, create jobs, and diversify the economy. Various empirical studies have examined the relationship between the manufacturing sector and economic growth. For instance, Jeon (2006) tested Kaldor's laws in China using time series and panel data, finding a significant positive relationship between manufacturing output and economic growth. In India, Chakravarty and Mitra (2009) applied a vector autoregressive (VAR) model and concluded that the manufacturing sector was a major contributor to economic development. While Dasgupta and Singh (2006) used the ordinary least squares (OLS) technique in their study and noted that the signs of deindustrialization in low-income areas continued to have importance capital in manufacturing. Oburota et al, (2017) used OLS to test both Kaldor's laws and endogenous growth theory. Their results indicated that manufacturing output, technology, and capital positively affected both short-term and long-term growth. Tsoku et al. (2017) applied Johansen cointegration methods in South Africa and found a long-run relationship between manufacturing and economic growth. In contrast, Androniceanu et al (2023) found weak evidence supporting Kaldor's laws in Kenya, suggesting that contextual factors can influence the role of manufacturing in economic development. Several studies have shown the importance of the manufacturing sector in Tanzania. Saidi et al, (2020) found that a one percent increase in manufacturing output results in a 1.2 percent increase in GDP, confirming the sector's strong contribution to economic growth.

3. Methodology

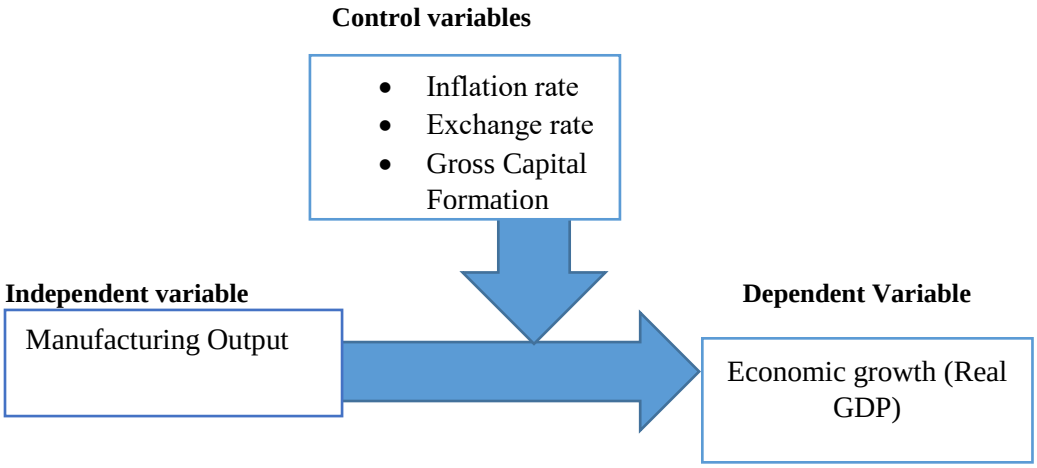
3.1 Research Design

The study used a quantitative research design to examine the impact of manufacturing sector on Tanzania's economic growth from 1990 to 2024. The choice of a quantitative design is made because the study aims to gather numerical data, which provides an objective understanding of the effects of manufacturing sector on economic growth in Tanzania. Kothari (2004) noted that quantitative data is more objective than qualitative data because it presents the results in the form of numbers and percentages, which are easier to analyze and interpret. The study used time-series data from 1990 to 2024, sourced from the World Bank and the Tanzania Investment Centre. For data analysis, the study employed econometric techniques, specifically the Autoregressive Distributed Lag (ARDL) model. This method helped to analyze the dynamic relationships between Manufacturing sector and Economic growth, while also accounting for other macroeconomic factors like Manufacturing Output, inflation, Real Exchange rates, Labor force and Gross Fixed Capital Formation (GCF)

3.2 Conceptual Framework

The conceptual framework for this study explains how selected macroeconomic factors influence economic growth in Tanzania, as measured by real GDP. The study conceptual framework is shown in figure 1.

Figure 1: Conceptual Framework



Source: Research group formulation

These factors include manufacturing output, gross fixed capital formation (GCF), labor force, inflation rate, and real exchange rate. The relationships are guided by well-known economic theories and supported by empirical literature. Manufacturing output was expected to positively influence economic growth. According to Kaldor's First Law (1957), the manufacturing sector is key to increasing productivity, generating employment, and driving long-term economic growth. Therefore, an increase in manufacturing output is likely to raise GDP.

3.3 Data Analysis

This study applied both descriptive and inferential statistical methods to analyze the time series data spanning from 1990 to 2024, in line with the research objectives and hypotheses used. The analysis was conducted using STATA version 15, a widely used statistical software for time series econometric analysis. Descriptive statistics such as the mean, median, standard deviation, minimum, and maximum were used to summarize the key characteristics of each variable. Additionally, line graphs and trend charts were used to represent the behavior of real GDP, Manufacturing Output, interest rate, exchange rate, Labor force, and Gross fixed capital formation over time, helping to identify long-term patterns, fluctuations, and potential relationships among variables. Before conducting inferential analysis, stationarity tests using the Augmented Dickey-Fuller (ADF) test was performed to determine the order of integration of each variable. Based on the stationarity results, the study employed the Autoregressive Distributed Lag (ARDL) model, to analyze the relationships among variables that were integrated of order I(0) and I(1). The ARDL model was used to estimate both short-run and long-run effects of the independent variables on economic growth. Furthermore, the necessary diagnostic tests including tests for autocorrelation, heteroscedasticity, multicollinearity, and normality of residuals were conducted to validate the robustness and reliability of the model results.

3.4 Model Specification

This study adopts and modifies a model commonly used in empirical literature to assess the relationship between the manufacturing sector and economic growth. One of the widely used models was derived from Kaldor's Growth Laws (Kaldor, 1957), which emphasize the central role of manufacturing in driving the

overall economic performance. The model is supported by recent empirical studies (AfDB, 2020). The mode specified includes manufacturing output as the core explanatory variable, along with other control variables that influence economic growth in Tanzania. Based on the conceptual framework and empirical relevance, the model includes gross capital formation (as a proxy for investment), labor force participation (as a proxy for labor input), inflation rate (to capture macroeconomic stability), and real exchange rate (to reflect trade competitiveness). The functional form of the model is expressed as follows:

$$\text{RGDPt} = \text{f(MANOt, GCFt, INFt, EXRt)} \quad \text{(1)}$$

The linear econometric form of the model is specified following equation 1 as follows:

$$\text{RGDPt} = \beta 0 + \beta 1\text{MANOt} + \beta 2\text{GCFt} + \beta 3\text{INFt} + \beta 4\text{EXRt} + \epsilon t \quad \text{(2)}$$

where by $RGDPt$ Is the Real Gross Domestic Product (proxy for economic growth), $MANOt$ is the Manufacturing output (is the value added by manufacturing sector, in constant prices), $GCFt$ is the Gross capital formation (% of GDP), $INFt$ is the Inflation rate (% annual change in CPI), $EXRt$ is the Real exchange rate (adjusted for inflation, TZS per USD), ϵt stands for Error term, $\beta 0$ is the Constant term, and $\beta 1, \beta 2, \beta 3,$ and $\beta 4,$ are the Coefficients of the explanatory variables.

3.5 Estimation Method

The model in this study was estimated using the Autoregressive Distributed Lag (ARDL) approach. This method is suitable because the study used time series data from 1990 to 2024, and the variables may not all be stationary at the same level. Before estimating the model, the Augmented Dickey-Fuller (ADF) test was conducted to check the stationarity of each variable. After confirming that all variables are either I (0) or I (1), the optimal lag length will be selected using the Akaike Information Criterion (AIC). To make sure the results were reliable, several diagnostic tests were performed, including the Breusch-Godfrey LM test for autocorrelation, the Breusch-Pagan test for heteroscedasticity, the Jarque-Bera test for normality of residuals, and the Variance Inflation Factor (VIF) for multicollinearity. Data analysis and estimation were done using STATA version 15. The general linear regression model estimated is given in equation 3:

$$ln(RGDPt) = \beta 0 + \beta 1 ln(MANUFt) + \beta 2 ln(GCFt) + \beta 3 INFt + \beta 4 ln(REXRt) + \epsilon t \quad \text{(3)}$$

Where the variables can be transformed into natural logarithms (except inflation, which is already in percentage form) to interpret the coefficients as elasticities and to stabilize variance. This log-linear form also helps reduce the effect of outliers and non-linearity in time series data. This model makes economic sense as it captures the most influential factors of growth, with a focus on the manufacturing sector (Kripfganz & Schneider, 2023).

3.6 Variables measurement and expected sign

Table 1 below summarizes the names of the variables, how they are measured, their expected signs, and the theories that support their use, the hypothesized effects, and the reasoning behind each assumption.

Table 1: The Variables Measurement and Expected Sign

Variable	Measurement	Expected Sign	Theoretical Linkage	Hypothesized Effect on Real GDP	Reason
Economic Growth	Annual growth rate of real GDP (%)	Dependent	Kaldorian Theory	–	Measures changes in overall economic performance

Manufacturing Output	Manufacturing output as % of GDP	(+)	Kaldor's First Law (1957)	Increase in manufacturing → ↑ GDP	Manufacturing increases productivity and job creation
Gross Fixed Capital Formation	% of GDP invested in physical capital	(+)	Productivity Theory (Smith, Ricardo)	More investment → ↑ GDP	Capital investment increases production and efficiency
Inflation Rate	Annual % change in Consumer Price Index (CPI)	(−)	Structuralist Theory (Prebisch, 1950s)	High inflation → ↓ GDP	High inflation reduces purchasing power and confidence
Real Exchange Rate	TZS per USD adjusted for inflation	(+)	Import Substitution Theory (Myrdal, 1960s)	Depreciation → ↑ GDP	Competitive rate encourages exports and local production

Source: Researcher's Construction (2025)

As shown in the table 1 above, this study used The five key variables used to examine the impact of manufacturing sector on economic growth in Tanzania are shown in table 1.

4. Empirical results

4.1 Descriptive Summary Statistics

Before analyzing the data, it was important to assess the statistical properties of each variable by calculating descriptive statistics. This helped in understanding how the variables did behave for all the 35 observations.

Table 2: Descriptive Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
gdp	35	5.166	1.91468	.58	7.67
mano	35	7.967714	1.814225	4.32	11.07
exr	35	1339.984	726.4617	196.6	2544.25
inf	35	11.12	9.375227	3.06	35.83
gcf	35	27.93429	9.867592	10.3	41.1

Source: STATA Estimation (2025)

Table 2 shows that gdp is the Real GDP (proxy for economic growth), mano is the Manufacturing output (% of GDP), gcf is the Gross capital formation (% of GDP), inf is the Inflation rate (% annual change in CPI), and exr is the Real exchange rate (adjusted for inflation, TZS per USD). The descriptive statistics presented in Table 2 summarize the key characteristics of the variables used in this study over the 35-year period. The results show that the average real GDP growth rate for Tanzania was about 5.17%, with a standard deviation of approximately 1.91. Suggesting that the country experienced a moderate economic growth on average, with some fluctuations over time. The minimum observed growth rate was 0.58%, which may correspond to years of economic slowdown, possibly due to domestic shocks or global economic disturbances (Mammadov, 2025).

The maximum growth rate of 7.67%, indicated periods of strong economic performance, which could be attributed to favorable macroeconomic conditions, increased investment, or strong export performance. Measured as a percentage of GDP, the manufacturing sector had a mean value of 7.97% ranged between 4.32% and 11.07%. This indicates that manufacturing has maintained a relatively modest but fluctuating

contribution to the national output. The observed variations may reflect changes in industrial policy, foreign investment in manufacturing, or structural challenges such as infrastructure constraints and limited access to finance. A standard deviation of 1.81 suggests moderate variability in the sector's performance over the years.

The real exchange rate, which reflects the price of one US dollar in Tanzanian shillings adjusted for inflation, had an average value of 1,339.98. However, the large standard deviation of 726.46 indicates considerable volatility in the exchange rate over the study period. The exchange rate ranged from a low of 196.6 to a high of 2,544.25, signifying significant currency depreciation over time. This depreciation may be linked to macroeconomic instability, rising demand for foreign currency, trade imbalances, or inflationary pressures. Inflation, measured as the annual percentage change in the Consumer Price Index (CPI), had a mean value of 11.12% with a standard deviation of 9.38. This relatively high average and large variability suggest that Tanzania experienced periods of both moderate and extreme inflation. The minimum inflation rate recorded was 3.06%, while the maximum was 35.83%. High inflation rates may be associated with supply shocks, exchange rate depreciation, fiscal deficits, or poor monetary control in certain periods.

Conversely, lower inflation levels might reflect successful stabilization programs or favorable external conditions. Gross capital formation (GCF), which serves as a proxy for investment and is expressed as a percentage of GDP, averaged 27.93% with a standard deviation of 9.87. This indicates that, on average, nearly 28% of the country's output was reinvested into productive assets such as infrastructure, machinery, and buildings. The wide range from 10.3% to 41.1% reflects differences in investment levels across years, which could result from varying government policies, donor inflows, domestic savings rates, or the availability of credit for the private sector. Overall, the descriptive statistics highlight the dynamic nature of Tanzania's macro-economic indicators over the study period. These variations are critical to consider in subsequent econometric analysis, as they may influence both short-run and long-run relationships among the variables under investigation

4.2 Unit root Test

Table 3: Unit Root Test Results for Dickey-Fuller test for unit root Number of Obs = 33

-------- Interpolated Dickey-Fuller -------						
Variable	**Probability Z(t)**	**Order of Integration**	**Test Statistics**	**1% Critical Value**	**5% Critical Value**	**10% Critical Value**
GDP growth (lgdp)	0.0000	I(1)	-7.754	-3.696	-2.978	-2.620
Manufacturing output(mano)	0.0000	I(1)	-6.452	-3.696	-2.978	-2.620
Exchange rate (exr)	0.0000	I(1)	-5.921	-3.696	-2.978	-2.620
Inflation rate(inf)	0.0000	I(1)	-5.181	-3.696	-2.978	-2.620
Gross capital formation (gcf)	0.0000	I(1)	-5.579	-3.696	-2.978	-2.620

Source: STATA Estimation (2024)

The results in table 3 indicate that all variables become stationary after first differencing, meaning that they were integrated of order one, I (1). This has been supported by the test statistics for each variable, which

were all negative than the 1%, 5%, and 10% critical values. Additionally, the associated p-values for all variables were 0.0000, which were well below the conventional significance levels of 1%, 5%, and 10% levels. The null hypothesis of a unit root for all variables after first differencing was rejected. The real GDP growth rate (lgdp) had a test statistic of -7.754, significantly lower than the 1% critical value of -3.696, confirming stationarity at first difference. Similarly, manufacturing output (mano) becomes stationary after differencing, with a test statistic of -6.452. The exchange rate (exr), inflation rate (inf), and gross capital formation (gcf) also exhibit stationarity at the first difference, with test statistics of -5.921, -5.181, and -5.579, respectively. These findings imply that all the variables used in the model are integrated of order one, I (1), and none is integrated of order two, I (2).

4.4 ARDL Co integrating and long run form: Model Estimation

Table 4 below presents the findings from an ARDL (Autoregressive Distributed Lag) model, which estimates both the long-term and short-term relationships between variables. The model includes an error correction term (ADJ), which indicates how quickly the dependent variable adjusts back to equilibrium after being disturbed. This term reflects the average time needed for the effects of external shocks or imbalances to be fully transferred from independent variables to the dependent variable (Kripfganz & Schneider, 2023).

Table 4: ARDL Model Estimation Results: Co integrating and Long-Run Relationship

Equation	Variables	Coefficient	t-statistics	Probability
ADJ (Coint-eq)	Lgdp (L1.)	-1.50632	-9.74	0.000
Long run Coefficients				
	Mano	-.028871	-0.22	0.829
	Exr	-.0027728	- 4.82	0.001*
	Inf	-.2139545	-5.84	0.000*
	Gcf	0.0924885	2.82	0.017*
Short-run Coefficients				
	mano(LD.)	-.3864612	-3.21	0.008*
	exr (L2D.)	.0087177	5.57	0.000*
	inf (L3D.)	.1681395	2.89	0.015*
	gcf(L3D.)	-.1258391	-3.15	0.009*
	Constant	11.9089	6.00	0.000

Source: STATA Estimation (2025) Note: From table 5 above, Star * indicate 5%, significance Level

Table 4 shows the results from the ARDL model, which explains how changes in manufacturing output, exchange rate, inflation, and capital formation affect real GDP growth, both in the long run and short run The coefficient of the error correction term (Lgdp L1.) is -1.506 and statistically significant at the 5% level. This means that there is a strong long-run relationship (co integration) between the variables. The negative sign confirms that if the system moves away from equilibrium, it will return back quickly. In fact, about 1.506% of the previous year's imbalance is corrected within one year, showing a fast adjustment toward the long-run equilibrium

4.6 Granger Causality Test Results

The Granger causality test is used to determine whether *one variable can predict or cause changes in another* over time. In this context, it tests whether changes in manufacturing output help predict future changes in GDP growth, and vice versa. This is useful for identifying *directional relationships* (causality)

between variables, which cannot be detected by correlation or co integration tests alone (Bayer & Hanck, 2013).

Table 5: Granger causality Wald tests

H_0: Manufacturing Output does not Granger-cause Economic growth
H_1: Economic growth does not Granger -cause Manufacturing Output

Equation	Excluded	Chi2	Df	Prob>Chi2
Gdp	Mano	15.311	4	0.004
Gdp	ALL	15.311	4	0.004
Mano	Gdp	7.2694	4	0.122
Mano	ALL	7.2694	4	0.122

Source: Stata estimation (2025)

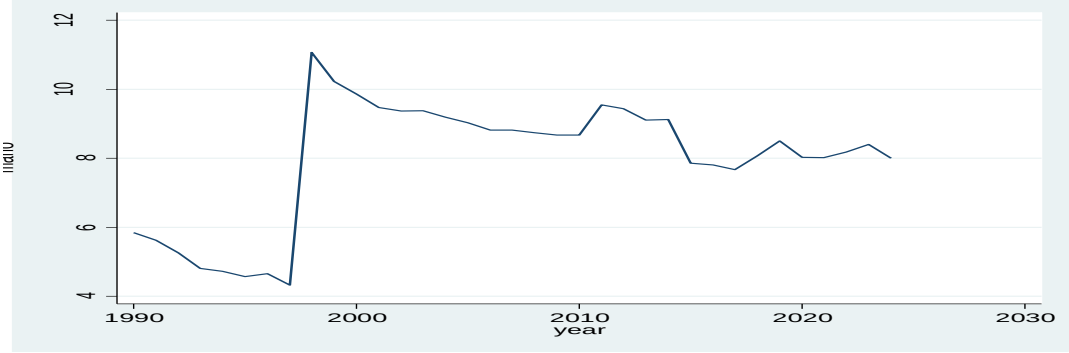
Table 5 shows that manufacturing output (mano) Granger-causes GDP growth, as the Chi-squared statistic is 15.311 with a p-value of 0.004 less than 0.005 which is significant at the 5% level. This means we reject the null hypothesis and conclude that past values of manufacturing output help predict future GDP growth in Tanzania. This result suggests a unidirectional causality running from manufacturing output to economic growth, supporting the idea that industrial development can be an engine for broader economic performance.

On the other hand, the reverse relationship from GDP growth to manufacturing output is not statistically significant. The Chi-squared value is 7.269 with a p-value of 0.122, is above the 1% significance level. Therefore, we fail to reject the null hypothesis, implying that GDP growth does not Granger-cause manufacturing output. This suggests that while growth in the manufacturing sector can influence the economy, general economic growth does not necessarily drive changes in the manufacturing sector.

4.7 The Trend analysis of Manufacturing Output inflows in Tanzania (1990-2024)

Figure 2 illustrates the historical trend of manufacturing output as a percentage of GDP in Tanzania over the 35-year period from 1990 to 2024. The overall pattern shows that manufacturing output has experienced noticeable fluctuations but has generally followed a modest upward trend over the long term.

Figure 1: The Trend analysis of Manufacturing Output in Tanzania



Source: STATA Estimation.

From the above figure 2, we can observe that during the 1990s, manufacturing output was unstable and contributed little to the national economy. This may have been due to economic difficulties, low investment,

and the effects of structural adjustment policies during that time. In the early to mid-2000s, there was a slow improvement in manufacturing output. This improvement might be linked to economic reforms, increased private sector involvement, and government efforts to support industrial development. The upward trend continued gradually, showing that the sector was slowly recovering and gaining importance in the economy (Rodrik, 2009). Between 2015 and 2020, the manufacturing sector experienced ups and downs. This uneven pattern could be the result of challenges such as poor infrastructure, power supply problems, or changes in the global market. From 2020 to 2024, a slight increase in manufacturing output was observed. This recent growth may be due to government policies focused on industrialization, better support to local industries, and regional trade opportunities (Warwick, 2013). In general, the trend shows that while manufacturing has not played a major role in Tanzania's economy in the past, it has started to grow slowly, although such growth was not stable. To make manufacturing a strong part of the economy, there is a need for consistent investment, good infrastructure, and strong support from the government and private sector (Dang & Pheng, 2015).

4.8 Post Estimation Test

Serial Correlation Test

The Breusch-Godfrey test for serial correlation was performed to check for serial correlation between the different lags of the residuals. The serial correlation of the residuals can lead to biased results **(**Schwartz & Whitcomb, 1977). The test was based on the following hypothesis used to analyze the results:

H_0: ρ=0, No serial correlation

H_1:ρ≠0, There is serial correlation

The decision criteria here was that we want to fail to reject the null hypothesis for the residuals to be serially uncorrelated in order to arrive to efficient unbiased estimates.

Table 6: Serial Correlation Test Results

Breusch-Godfrey LM test for autocorrelation			
lags(p)	chi2	df	Prob > chi2
1	02.429	1	0.1191
	H0: no serial correlation		

Source: STATA Estimation (2025)

Table 6 presents the results of the Breusch-Godfrey LM test for serial correlation, which was used to check whether the residuals (errors) from the estimated ARDL model are correlated over time. Serial correlation, if present, can lead to biased and inefficient estimates, so it is important to test for it. The null hypothesis of the test is that there is no serial correlation in the model's residuals. The test result shows a Chi-square value of 2.429 with 1 degree of freedom, and a probability value (p-value) of 0.1191. Since the p-value is greater than the common significance levels (0.01, 0.05, or 0.10), we fail to reject the null hypothesis. This means that there is no evidence of serial correlation in the model. In other words, the errors in the model do not follow a pattern and are randomly distributed, which confirms that the model is correctly specified in terms of autocorrelation (Griffith & Plant, 2022).

4.8.1 Heteroscedasticity Test

This is the test for constant variance; where the assumption is that residuals have a constant variance in both the Ordinary Least Square estimation and ARDL model. This test is done to check whether the residuals produces efficient estimation since a model with heteroskedastic residuals produces inefficient estimation (Tse, 2002).

The hypothesis testing for heteroscedasticity is given as follows:

H_0: ρ=0, Constant Variance of the residuals-Homoskedastcity

H_1:ρ≠0, Non-constant variance of the residuals-heteroskedasticity

The criterion for this test is to fail to reject the null hypothesis, which assumes that the residuals have constant variance (Garson, 2012).

Table 7: The Breusch-Pagan/Cook-Weisberg Heteroscedasticity Test

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity
Ho: Constant variance of the residuals
Variables: fitted values of gdp
chi2(1) = 0.35
Prob > chi2 = 0.5542

Source: STATA Estimation (2025)

The Breusch-Pagan/Cook-Weisberg test was conducted to determine whether the residuals in the regression model exhibited constant variance, which is a key assumption in Ordinary Least Squares (OLS) estimation. The null hypothesis of the test assumes that the error terms have constant variance (homoskedasticity).
As shown in Table 7, the test results reveal a Chi-squared statistic of 0.35 and a corresponding p-value of 0.5542. Since the p-value is greater than the 5% level of significance, the null hypothesis cannot be rejected. This indicates that there is no evidence of heteroskedasticity in the model. Therefore, the assumption of constant variance is satisfied, and the model estimates can be considered reliable and efficient without the need to apply robust standard errors.

5. Conclusion and Policy Implications

5.1 Conclusion

This study examined the impact of the manufacturing sector on economic growth in Tanzania for the period 1990 to 2024. Time series data were applied to Autoregressive Distributed Lag (ARDL) model alongside Granger causality tests to explore the trends within the manufacturing sector and its contribution to economic growth in both the short and long run, and the causal relationship between manufacturing output and GDP growth. The findings revealed that Tanzania's manufacturing sector has experienced a gradual upward trend over the 35-year period, the sector had little improvements in the early 2000s and some growth after 2020. These trends reflect both progress and persistent challenges such as limited investment, poor infrastructure, and inadequate access to credit and technology. The ARDL model results showed that in the long run, the effect of manufacturing output was not statistically significant on economic growth in Tanzania. Which suggested that, over time, the sector did not contribute meaningfully to sustained economic expansion, possibly due to structural inefficiencies or underutilization of industrial capacity.
These findings are consistent with Shirima and Mlaki (2022), who noted that Tanzania's manufacturing sector has contributed positively to GDP despite facing challenges such as inadequate infrastructure and limited financing. Nchimbi and Mwakalinga (2021) have also highlighted similar concerns, emphasizing that poor infrastructure, limited credit access, and a shortage of skilled labor continue to undermine sector performance. Overall, the trend analysis supports the view that the sector is growing but remains fragile and underutilized. These findings differ from Saidi et al. (2020) and Kwayu et al. (2018), who found a strong positive relationship between manufacturing output and GDP growth. The divergence may result from methodological differences or updated data reflecting recent policy or market conditions. The findings of this study underscore the importance of the manufacturing sector as a potential engine of economic growth in Tanzania. However, the sector's contribution remains limited, particularly in the long run, due to structural weaknesses and policy constraints. The study recommends that important policy measures be put in places in support of ongoing efforts to achieve sustainable economic growth.

References

AfDB. (2020). *African economic outlook 2020: Developing Africa's workforce for the future*. African Development

Bank Group. https://www.afdb.org

Androniceanu, A., Sabie, O. M., & Cristescu, M. P. (2023). The impact of manufacturing sector development on economic growth in emerging economies. *Sustainability, 15*(2), 778. https://doi.org/10.3390/su15020778

Bayer, C., & Hanck, C. (2013). Combining non-cointegration tests. Journal of Time series analysis, 34(1), 83-95.

Bernal, R., Peña, X., & Torres, J. (2017). Manufacturing and economic growth in Latin America: Evidence from panel data. *Latin American Economic Review, 26*(1), 1–21.

Chakravarty, M., & Mitra, A. (2009). Is industry still the engine of growth? An econometric study of the organized sector employment in India. *Journal of Policy Modeling, 31*(1), 22–35. https://doi.org/10.1016/j.jpolmod.2008.06.002

Chioveanu, I., & Dima, B. (2019). The impact of manufacturing on economic growth in Romania. *Economic Computation and Economic Cybernetics Studies and Research, 53*(2), 19–34.

Dang, G., & Pheng, L. S. (2015). Infrastructure investments in developing economies. Springer Science Business Media Singapore. DOI, 10, 978-981

Dasgupta, S., & Singh, A. (2006). Manufacturing, services and premature deindustrialization in developing countries: A Kaldorian empirical analysis. *Centre for Business Research, University of Cambridge Working Paper No. 327*.

Dang, G., & Pheng, L. S. (2015). Infrastructure investments in developing economies. Springer Science Business Media Singapore. DOI, 10, 978-981

Dzansi, J., & Quartey, P. (2017). Manufacturing and economic growth in Africa: A panel data analysis. *African Development Review, 29*(2), 89–101. https://doi.org/10.1111/1467-8268.12242

Evans, O. (2014). The industrial sector and economic development in Kenya. *International Journal of Business and Social Science, 5*(3), 20–30.

Griffith, D. A., & Plant, R. E. (2022). Statistical analysis in the presence of spatial autocorrelation: selected sampling strategy effects. *Stats*, *5*(4), 1334-1353.

Gebreeyesus, M., & Iizuka, M. (2017). The structure and performance of Ethiopia's manufacturing sector. *UNU-MERIT Working Paper Series, 2017-001*.

Haque, A., & Islam, R. (2018). The role of the manufacturing sector in economic growth and employment generation in Tanzania. *Journal of African Development Studies, 10*(1), 33–48.

Haraguchi, N., Cheng, C. F. C., & Smeets, E. (2017). The importance of manufacturing in economic development: has this changed? *World Development*, *93*, 293-315.

Hendry, D., & Pretis, F. (2016). All change! The implications of non-stationarity for empirical modelling, forecasting and policy. *Oxford Martin Policy Papers*.

Griffith, D. A., & Plant, R. E. (2022). Statistical analysis in the presence of spatial autocorrelation: selected sampling strategy effects. *Stats*, *5*(4), 1334-1353.

Jeon, Y. (2006). Manufacturing and economic growth in China: A Kaldorian approach. *Journal of Post Keynesian Economics, 28*(4), 649–667. https://doi.org/10.2753/PKE0160-3477280410

Kaldor, N. (1957). A model of economic growth. *The Economic Journal, 67*(268), 591–624.

Kothari, C. R. (2004). *Research methodology: Methods and techniques* (2nd ed.). New Age International Publishers.

Kripfganz, S., & Schneider, D. C. (2023). ARDL bounds testing using Stata. *Stata Journal, 23*(1), 1–25. https://doi.org/10.1177/1536867X231152143

Kwayu, S., Kipesha, E. F., & Mwakalobo, A. (2018). Industrial development and economic growth in Tanzania: Empirical analysis using time series data. *Tanzania Economic Review, 8*(2), 1–18.

Mammadov, B. (2025). Slowing Global Growth and Rising Recession Risks: Causes, Consequences, and Policy Responses. *Porta Universorum*, *1*(3), 224-244

Mercan, M., Gocer, I., Bulut, S., & Dam, M. (2015). The relationship between economic growth and manufacturing industry in developing countries: Panel data analysis. *Procedia Economics and Finance, 23*, 1037–1044. https://doi.org/10.1016/S2212-5671(15)00462-4

Mwinuka, C., & Mwangoka, D. (2023). Tanzania's industrial policy implementation challenges: A focus on manufacturing. *International Journal of African Development, 10*(1), 88–102.

Naudé, W., & Szirmai, A. (2012). The importance of manufacturing in economic development: Past, present and future perspectives. *UNU-MERIT Working Paper Series, 2012-041*.

Nchake, M., Edwards, L., & Rankin, N. (2016). Globalisation and employment in South Africa's manufacturing sector:
A firm-level analysis. *Journal of International Development, 28*(1), 35–57.

Nchimbi, H. M., & Mwakalinga, M. A. (2021). Challenges facing the manufacturing sector in Tanzania: Infrastructure, finance, and skills gap. *Tanzania Economic Review, 11*(2), 88–102.

Nkinga, N., Mgumba, A., & Said, J. (2017). The contribution of manufacturing sector to economic growth in Tanzania. *Eastern Africa Social Science Research Review, 33*(1), 123–142.

Oburota, K. M., Umeh, J. C., & Nwachukwu, I. N. (2017). Manufacturing sector and economic growth in Nigeria: A test of the Kaldor's laws. *International Journal of Economics and Management Studies, 4*(1), 29–36.

Olamade, O. O., & Oni, T. E. (2016). Industrialization and economic development: A review of Kaldor's theory. *Journal of Economics and Sustainable Development, 7*(5), 12–20.

Oyinlola, M. A., & Olaifa, T. T. (2018). The role of manufacturing in Nigeria's economic growth: An empirical investigation. *Journal of African Business, 19*(1), 88–104.

Rahman, A. A., & Ismail, M. T. (2022). Industry 4.0 and economic growth: Evidence from Malaysia's manufacturing sector. *Asian Economic and Financial Review, 12*(3), 271–284.

Rodrik, D. (2009). Growth after the Crisis (p. 02138). London, UK: Centre for Economic Policy Research.

Saidi, A., Kweka, J., & Mbowe, W. (2020). The contribution of the manufacturing sector to economic growth in Tanzania. *Tanzania Journal of Development Studies, 18*(2), 45–59.

Seck, A., Karingi, S., & Getachew, Y. (2022). Infrastructure and trade policy in Africa: An industrialization perspective. *African Development Review, 34*(1), 1–14

Shirima, R. S., & Mlaki, J. P. (2022). Manufacturing sector and economic growth in Tanzania: A VAR model analysis (1990–2019). *East African Journal of Economics and Finance, 3*(1), 74–90.

Silver, H. (2019). Industrial transformation in Tanzania: Historical and policy perspectives. *Tanzania Journal of Economics and Management Sciences, 20*(1), 15–30.

Schwartz, R. A., & Whitcomb, D. K. (1977). Evidence on the presence and causes of serial correlation in market model residuals. Journal of financial and quantitative analysis, 12(2), 291-313.

Szirmai, A. (2013). *Pathways to industrialization in the twenty-first century: New challenges and emerging paradigms*. Oxford University Press.

Tse, Y. K. (2002). Residual-based diagnostics for conditional heteroscedasticity models. The Econometrics Journal, 5(2), 358-373.

Tsoku, M. S., Malefane, M. R., & Bonga-Bonga, L. (2017). Manufacturing sector and economic growth in South Africa: A cointegration approach. *Journal of Economics and Behavioral Studies, 9*(5), 113–120.

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. Dar es Salaam: REPOA.