http://journals.uonbi.ac.ke/index.php/adfj
ISSN 2522-3186

# Does industrial sector performance influence Gross Domestic Product in Tanzania?

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***Abstract***

*Tanzania's sustainable growth is strongly reliant on the relationship between industrial sector performance and GDP. The study looked at annual data from 2000 to 2019. The secondary data was analyzed using both descriptive and vector autoregressive approaches. The descriptive techniques used frequency tables, whilst the regression techniques included the stationary Augmented Dickey Fuller (ADF) evaluation, the Johansen Co-integration Test, and the Error Correction Model. The study also employed the Granger causality test to determine the direction of causality among the model variables. The ADF results show that while the variables are not stationary at the individual level, they are stationary at the first difference. The results of the Johansen co-integration reveal that there is a long-term relationship between industrial productivity indices (industrial exports, industrial value added, and production volume) and the GDP. In contrast, the VECM results reveal that the industrial productivity indicators (industrial value added, industrial exports, and production volume) have a long-term but minor impact on Tanzania's GDP. To summarize, Tanzania has completed significant growth in infrastructure rebuilding and the application of supportive strategies to stimulate the industrial sector, providing that the attractiveness of the industrial sector is regarded as a critical necessity for economic development because it causes creative economic development. Nevertheless, in order to attain long-term economic development, the study suggests that the industrial sector's institutional, legal, and fiscal climate be strengthened to boost its competitiveness.*

***Keywords:*** *Industrial sector; Gross Domestic Product; Tanzania*

## Introduction

The industrial sector provides unique chances for technological innovation, capital accumulation, and economies of scale that are less common in agriculture and services. Linkage and spillover effects, which are backward and forward links between distinct sectors and subsectors, generate positive externalities for investments in the given sectors, which are stronger in industrial than agriculture or services. Transferring money from cultivation to production provides credit for systemic reform. Developing countries with greater per capita incomes have had significant growth in GDP and employment over the last several years (Attiah, 2019). Industrialization has been the primary driver of economic growth, structural change, and recovery. As a result, it has long been a pillar of many national economies, creating productive jobs and long-term economic growth (Emilia, 2015). Furthermore, the sector not only promotes innovation and technological improvement, but it also generates major job opportunities through small and medium-sized enterprises (SMEs) in the beverage, food textile, and, and steel and iron productions (Mwang'onda,

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Mwaseba, and Juma, 2018). Despite its importance to the economy, the sector's performance differs by economy.

Since Tanzania's independence in 1961, the industrial sector has seen significant transformation. However, these changes reflected national economic policies that changed with domestic demand and global market dynamics, with the goal of improving the economy's productive capacity through structural economic reforms (Tanzania Invest 2020). However, despite the sector's ability to reach high levels of productivity, its relevance to the national economy varies with time as a result of structural changes. Nonetheless, beginning roughly 2000, when the rate of structural change began to increase up after a continuous reduction in prior years, the pattern has switched towards one that fosters growth (John, 2016). Furthermore, the growth rate of industrial activity was 8.3% in 2018 compared to 8.2% in 2017, with a GDP gain of 26,71779 TZS millions in the third quarter of 2019 from 23,84031 TZS millions in the second quarter (NBS, 2019). This was ascribed to an increase in the manufacture and exportation of series of industrial value-added items, such as food products, soft drinks, cement, wheat flour, metal products, and chemical products, as well as an increase in the consumption of locally produced products (Ministry of Finance and Planning, 2019).

Despite numerous policy reviews and implementations, there has been little evaluation in the field of industrial productivity indicators and the country's major economic indicators. In this regard, the study aims to assess how the productivity of the industrial sector affected economic performance from the recovery of the industrial change in 2000-2020, which was the vision of transforming Tanzania into an industrial economy that promotes jobs and long-term social welfare in relation to GDP and employment, using IVA, IEXP, and PRD as study predictor variables.

**Background**

Asian economies have dominated the twenty-first century industrial sector, starting with Japan and advancing to Singapore, Indonesia, Malaysia, Taiwan, and, most recently, China. These Asian tiger countries have emerged as manufacturing hubs for the world's most well-known products and brands, owing to economies of scale enabled by the availability of relatively cheap and trained labour, well-defined investment rules, and environmental protection (Mwang'onda et al., 2018). Despite their dominance, worldwide demand for industrial products is expected to shrink in 2019 due to rising trade and tariff tensions

between the world's biggest producers: China, the United States, and Europe. US import restrictions on many manufactured goods, compounded by Brexit fears, contributed to a decline in EU productivity (UNIDO, 2019). Governments in Africa, on the other hand, are becoming increasingly cognizant that industrialization is vital to preparing Africans for the next stage of economic development. Few African countries, such as Botswana, South Africa, and Mauritius, are currently performing well in the sector because most African supervisions are stagnant observing for new and creative ways to entice speculation and assist industries in implementing strategies such as directed substructure investment, county combination, and the establishment of special economic zones (SEZs) for importance subsectors (Chelsea, 2018).

Tanzania's recent progress towards industrialization may be traced back to its independence in 1961, when an industrialization plan aimed at import substitution was undertaken. A variety of initiative ideas and approaches were explored (Hafidh, 2018). Nonetheless, the rate of structural change has increased from around 2000 to the present, as many industries established during the subsequent period of independence failed to survive, resulting in a sharp decline in industry's economic role and a long period of sluggish industrial growth, with the industrial share of GDP falling from more than 22 percent in 1975 to less than 10 percent in 1990 (John, 2016). Structural changes in the industrial sector have taken a new direction, with industrialization phases being included in the country's national five-year development plan, which aims to promote economic growth and human development. However, these changes are consistent with the mkukuta (national strategy for growth and poverty reduction) and the CCM 2015-2020 (industrialised economy slogan) election manifestos, which aim to transform Tanzania into an industrial economy that will boost jobs and sustainable social welfare by 2020 while attracting private sector investments, particularly in textiles, food and animal feed industry, leather and meat, fish, edible oil, drugs, and medical equipment (Kibwana, 2020).

In general, since the 1990s, these financial transformations have completed a significant difference in the industrial sector's performance, as what is considered the current state and development of industrialization in general, and industrial in particular, has grown over time, with some evidence of new dynamism in the sector, with a record increase in total number of employees from 242,654 in 2014 to 306,180 in 2018, with exports of industrial value-added commodities are expanding, particularly marble, plastic, and aluminium products, accounting for 24.8% of total non-traditional goods export earnings from manufactured goods

(Ministry of Finance and Planning, 2019). Nonetheless, the industrial sector's contribution to GDP and development rate has persisted comparatively stable over the last decade, despite the fact that some industrial subsectors have expanded while others have stagnated, with the greatest lively subsectors in relationships of output growth, export growth, and domestic value adding being limited by their reliance on imported raw materials (Wangwe and Mmari, 2016). Even with the strong economic growth in the first three quarters of 2019 (6.9%), which was similar to an official rate of 7.0% in 2018, the spread of Covid-19 affected the labour market, production capacity, and productivity in Tanzania as domestic industries deteriorated due to slumped industrial exports, anticipating a slowing of the economic growth rate despite the lower rate of transmission in the country compared to Europe and the United States (Abebe Adugna et al., 2020).

## Literature Review

This section reviewed theoretical and empirical literature related to industrial sector performance and gross domestic product.

### Theoretical Review

David Ricardo, an 18th-century economist, developed the theory of comparative advantage in 1817. He struggled that a republic's fiscal development is increased by directing on the manufacturing in which it has the highest comparative advantage (Press, 2002). Ricardo believes that any country must have a comparative advantage in a product, no matter how inefficient it is by international standards. Having a comparative advantage in a product does not suggest that the nation is better at it than other countries; rather, it means that the country is the best at that activity out of all the ones it might be performing (Economic Commission for Africa and UN, 2016). It is critical to understand that Ricardo's theory of comparative advantage was based on the assumptions that production is subject to constant return to scale, there is no possibility of technological change altering production factors, full employment exists in both countries, ignoring the realities of life in many developing countries around the world, particularly in Africa, the cost of production will be measured in terms of labour, and the value of a commodity (David. 2015).

Though the theory of comparative advantage has many critics, the beauty of the idea is that even if a country is the most (or least) effective at producing something, it can still benefit from trading with other countries because specialising in the goods that it is the best (or least bad at) allows it to increase its production and

consumption through foreign trade (Economic Commission For Africa and UN, 2016). As a result of the assumptions about employment and labour as a component of production, the theory defines one objective as the dependent variable: employment as a proxy for economic success

Furthermore, the theory provides three independent variables that are proxy of industrial productivity indicators, such as industrial value added due to the context of how the value of a commodity is measured, production volume due to productivity assumptions, and industrial export in relation to the context of the theory of comparative advantage in international trade in the analysis and interpretation of data while assessing industrial as a factor of economic performance.

The Solow growth model is a neoclassical economic development theory proposed by Robert Solow and Trevor Swan in 1956 to show how steady economic growth is aided by a mix of three factors: labour, capital, and technological engines (Banton, 2020). Economic growth is a complicated process, thus the model focuses on four factors that are used to predict long-term development: output (Y), capital (K), labour (L), investment (I), and savings. Consider the fact that money, labour, investment, and technology all contribute to manufacturing. Solow's proposal included four important assumptions: First and second, labour force growth and technology are assumed to be exogenous factors, implying that labour force growth is constant; third, the model assumes that capital and labour have a constant return to scale; and fourth, the model assumes a declining return on its variable factor GDP per capita (Kabir, 2019).
The Solow Production Function.

$$Y_t = F(K^{\propto}, L^{1-\propto})$$
$$Y_t = K_t^{\propto}(A_t L_t)^{1-\propto}$$

The model assumes a constant return to scale, which indicates that if capital and labour inputs increase in the same proportion, so does output. The production functions define total output (Yt) as a function of capital input (K) and labour input (L). The parameter α may be interpreted as the percentage of total output earned by capital input and (1 - α) the share of output earned by labour input when both inputs are compensated by their respective marginal products.

$$S(K^*) = (\delta + n)K^*$$

The function takes (S) as savings, depreciation as depreciation, n as population growth rate, and C as capital per worker. The theory therefore designates GDP as one of the study's objectives based on GDP per capita

assumptions and the fact that GDP is a linear composition of a series of components such as investment, capital, and labour input, which is compatible with the reality that economic growth is a complicated process.

**Empirical Review**

Extensive empirical research and data have demonstrated the importance of industrialization in economic growth and structural transformation. Furthermore, expanding the industrial and secondary industries is a critical step in the industrial growth process, especially in the beginning (Guangzhe, Michael, and Minghui, 2015). In his research, the Kaldor formula was used to establish a relationship between industrial value added and employment in multiple sub-periods spanning 1970 to 1990 and 1990 to 2013. However, time series data collected over various eras demonstrated no significant change in the relationship after 1970, particularly in terms of achieving high sustained economic growth.

Victoria (2019) looked at the elements that affect the industrial sector's performance and contribution to Nigeria's GDP. However, the study used the co-integration test and a vector error correlation model to calculate the contribution of labour force, gross fixed capital formation, average production, capacity utilisation, exchange rate, interest rate lending, government capital expenditure, and IVA to GDP. The study's findings revealed that gross fixed capital formation and the exchange rate had a positive and significant long-term relationship with IVA, whereas lending interest rates, government spending, and average industrial capacity utilisation had a negative and significant long-term relationship with IVA. However, the labour force created a favourable although negligible association.

Rioba (2015) investigated the role of the industrial sector in Kenya's economic growth from a Kaldorian perspective. The study examined data from a time series from 1971 to 2013. The dependent variables included the real GDP growth rate, the industrial output growth rate, the non-industrial output growth rate, and the employment growth rate. The obtained data was examined using the ordinary least squares approach. The study revealed a positive relationship between output and economic development in Kenya, but it is inadequate to drive further progress.

Odero (2017) explored the causal relationship between industrial value addition and economic development in Namibia. The study used unit root, co-integration, and pairwise Granger causality approaches to assess

yearly time series data from 1980 to 2015 to determine if the two variables are predictable. However, the findings were confusing since the unit root check indicated that all variables of order zero are merged and co-integrated. The data showed a long-term correlation between the variables, but the Granger causality test revealed no causal relationship to or from both variable.

Ududechinyere (2018) explored the relationship between industrial sector production and economic development in Nigeria. The study analyzed data from 1981 to 2016 using an auto regressive model and granger causality. Furthermore, the study employed RGDP, Industrial Output (IO), government spending, industrial capacity utilization, money supply, and interest rates as dependent variables to identify both short-term and long-term relationships between variables. The data found that industrial capacity utilization had a beneficial influence on RGDP, as did MO. This also demonstrated that GOVEXP had a negative impact on RGDP, but money supply had a favourable effect. Furthermore, evidence for unidirectional causation between RGDP and MCU, LMO, and LM2 was found. Karami and Elahinia (2019), examined the impact of value-added production on European economic growth. The research used data from twenty-five countries rated as Europe's most competitive economies in the 1995-2016 period. However, the study used Gross Domestic Product (GDP) as the dependent variable and IAV, GFCF, and HTE as the independent variables, necessitating the use of multiple regression models, such as OLS, fixed effects, and random effects, to assess the descriptive statistics. According to the study's empirical findings, economic growth has a considerable positive association with industrial, labour force, and technology, while the relationship with investment is considerably negative. Tanzania's GDP and the performance of its industrial sector the subsequent theory is proposed.

$H_{1a}$: Industrial Value Added positively influence GDP from Tanzania

$H_{1b}$: Industrial Exports positively influence GDP from Tanzania

$H_{1c}$: Production Volume positively influence GDP from Tanzania

**Methodology**

A time series study design is one that is based on the longitudinal character of research and involves repeatedly studying or measuring a single research unit or subject throughout time (Cooper and Schindler, 2011). This study methodology sought to accomplish and offer an underlying realistic pattern of development in Tanzania's economy over a 20-year period (2000-2020).

**Sample of Data**

This study used a time series design, using data obtained from statistical observations made over a 20-year period on Tanzania's yearly GDP in connection to the industrial sector. The study examined factors of relevance in time series data from 2000 to 2020. The data used adequately the sample size for operative econometric analyses for the period under examination was widespread as the lined exclamation of the annually available data was available and then used to calculate them to attain an unqualified relative between the variables listed in the study.

**Measurements of variables and sources of data**

The industrial sector is assessed by its value added, exports, and output volume, whereas GDP is defined by the production of products and services. The study examined quantitative time series data from a UNCTAD database over a 20-year period, beginning with the acceleration of structural change in 2000 to boost industrial sector growth and ending with Tanzania being a middle-income country by 2020.

**Model specification**

The study used a Vector Error Correction model to investigate the dynamic long-run association between industrial sector performance and Gross Domestic Product in Tanzania using a 20-year time series data from the model structure, which provides information about variables or groups of variables that can forecast other variables.

$$GDP_t = \alpha + \beta_1 GDP_{t-1} + \beta_2 GDP_{t-2} + \beta_3 GDP_{t-3} + \varepsilon_t \quad \text{..... (1)}$$

Equation one of the VECM demonstrates the link between GDPt as a dependent variable and the predictor variables of IIVA, IEXP, and PRD indicated by β1, β2, and β3.

Thus, the empirical model based on the time series model is;

$$GDP_t = \alpha + \beta_1 IVA_{t-1} + \beta_2 IEXP_{t-2} + \beta_3 PRD_{t-3} + \varepsilon_t \quad \text{..... (2)}$$

Where;

α is the intercept constant,

$\beta_1$, β2, and β3 are the coefficients of predictor variables of IVA, IEXP and IPV respectively

$GDP_t$ variable represents GDP as a dependent variable in a specific time.

$\varepsilon_{t\ is}$ the error term considered as the white noise

IEXP = Industrial Export

IGDP= Industrial Gross Domestic Product

IVA=Industrial Value Added

PRD =Production Volume

## Findings and Discussions

### Descriptive Statistics

Equation one of the VECM demonstrates the link between GDPt as a dependent variable and the predictor variables of MIVA, IEXP, and PRD indicated by β1, β2, and β3.

Thus, the empirical model based on the time series model is;

***Table 1: Descriptive statistics***

| | LNGDP | LNIEXP | LNIVA | LNPRD |
|---|---|---|---|---|
| Mean | 21.3623 | 20.4444 | 21.0612 | 21.9337 |
| Median | 22.2355 | 20.2944 | 21.2077 | 22.0858 |
| Maximum | 21.3530 | 23.5024 | 22.1701 | 22.6037 |
| Minimum | 22.0233 | 17.2838 | 19.9384 | 21.0937 |
| Std. Dev. | 0.4433 | 1.9533 | 0.7784 | 0.5478 |
| Skewness | -0.0236 | 0.0635 | -0.0842 | -0.8020 |
| Kurtosis | 1.3622 | 1.7342 | 1.4111 | 1.4036 |
| Jarque-Bera | 1.2322 | 1.3485 | 2.1293 | 2.3177 |
| Probability | 0.3695 | 0.5095 | 0.3449 | 0.3138 |
| Observations | 20 | 20 | 20 | 20 |

Source: Source: Researcher own compilation and values obtained from E-Views.

The results in Table 1 offer a descriptive analysis of the variables utilised in the model in log form to reduce data ambiguity. The table shows that industrial exports (LNIEXP) had a high degree of unpredictability

between 2000 and 2019, as evidenced by the Standard Derivative of 1.9533, which is very far from the average score of 20.4444, indicating that there is greater variability in data because the variable was dispersed very strongly from the sample mean. For a normal distribution, the skewness should be equal to zero. Table 1 shows that all of the variables (LNGDP, LNIVA, and LNPRD) are statistically different from zero by -0.0236, 0.0635, 0.0635, and -0.0842 and -0.8020, respectively.

**Normality Test**

***Table 1: Normality Test***

| **Shapiro-Wilk Test for Normal data** | | | | | |
|---|---|---|---|---|---|
| **Variable** | **Obs.** | **W** | **V** | **Z** | **prob>Z** |
| LNGDP | 20 | 0.9384 | 1.4570 | 0.7590 | 0.2240 |
| LNIEXP | 20 | 0.9514 | 1.1500 | 0.2820 | 0.3889 |
| LNIVA | 20 | 0.8779 | 2.8900 | 2.1380 | 0.0162 |
| LNPRD | 20 | 0.8651 | 3.1940 | 2.3400 | 0.0096 |

Critical value (α), 5%, 1%

Decision criteria. Reject the null hypothesis when $W < W\alpha$ (p-value < α).

According to the Shapiro test in table 2, the sample data for LNGDP and LNIEXP are normally distributed since their P-values are greater than the significant alpha value (5%). As a consequence, at the 5% level of significance, the null hypothesis cannot be rejected since the sample data is normal. However, the sample data for LNIVA and LNPRD are not normally distributed since the p-values are less than the significant alpha value (5%).

However, the Jarque-Bera test verifies the null hypothesis since the test results demonstrate that all of the sample's data are normally distributed, indicating that the Shapiro-Wilk test errors have been rectified by the Jarque-Bera test statistic. As a result, there is sufficient evidence to conclude that the data sample is normal at the 5% significance level.

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ISSN 2522-3186

**Trend Analysis**

In Figure 1, a trend review of the 20 observations from all the series is carried out and presented as follows;

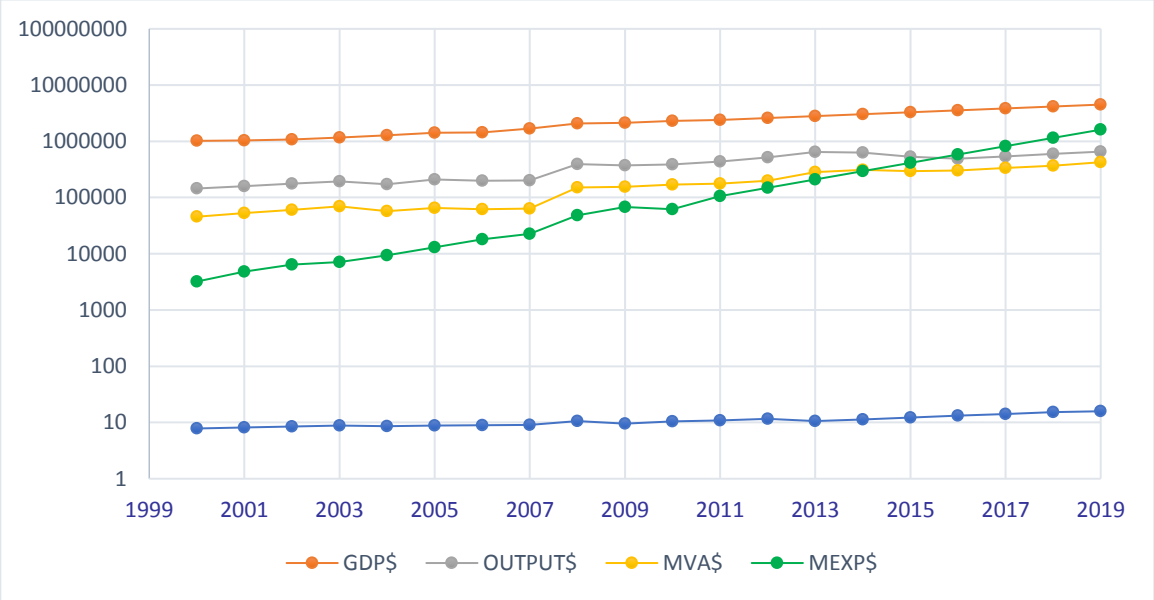


*Figure 1: Trend Analysis*

**Source; Researcher own compilation from data extracted from UNCTAD**

According to UNCTAD statistics, Tanzania's macroeconomic performance metric GDP has increased during the period under consideration, as seen in Figure 1. This can be attributed to improved structural and economic transformations, which have managed to boost the country's competitiveness and performance levels for most economic activities such as industrial, tourism, agriculture, and service sectors. GDP rose from approximately $22.9 billion in 2012 to approximately $44.97 billion in 2019, indicating a boosted GDP output level by an annual average growth rate of 8.2%.

Industrial productivity metrics, on the other hand, fluctuated but remained generally upward between 2001 and 2018, with an annual growth rate of 10.1% for production volume and an annual average growth rate of 15.4% for IVA output, while IEXP fluctuated more broadly, with an annual average growth rate of 40.5% for the latter. This was connected with an increase in real IVA output levels, as well as enhanced innovativeness and competitiveness in production volume, comparable to some items such as processed food, clothes, and chemical products, which have improved market competitiveness and sales performance.

During the study period, inactive movements in the macroeconomic variable of industrial value added were also observed, as trends show that, despite the country's economic and structural changes, the patterns show a slight flip of 4.0% in annual average growth rate between work margins from 2004 to 2018, as shown in the graph. Thus, it is reasonable to assume that Tanzania's expanding demographic trends have not resulted in a continuous growth in the number of employment, as a large proportion of individuals remain unemployed.

**Stationarity Test**

A time series is considered to be stationary if it does not have a pattern. Before executing any association model, a unit root test with the Augmented Dickey Fuller (ADF) test is done to examine the link between two variables while keeping the effects of other related variables constant (ceteris paribus). The rationale for this test is to avoid the possibility of a false regression.

***Table 3: Unit Root Test***

| | **Individual Levels** | | **1st difference** | |
|---|---|---|---|---|
| Method | statistic | Prob** | statistic | Prob** |
| ADF-fisher chi-square | 1.0929 | 0.9997 | 67.9750 | 0.0000 |
| ADF-choi Z-stat | 3.8428 | 0.9999 | -6.7678 | 0.0000 |

Note: Significant at 10%, Significant at 5%, Significant at 1%

The results of this test are presented in Table 4.3. Clearly, variables such as LNEMPL, INGDP, LNEEXP, LNMVA, and LNPRD are not stationary at their respective levels, but are stationary at the first difference level. This is because the P-values of the data series of the statistic variables are larger than 5% at their levels, but at their first difference, they are less than the desired 5% threshold of significance. As a result, we reject the null hypothesis that there is no unit root (non-stationary).

**Heteroskedasticity Test**

The hypotheses are as follows:

$H_0$: There is no heteroskedasticity in the models

$H_1$: There is heteroskedasticity in the models

***Table 2: White Heteroskedasticity Test***

| Heteroskedasticity test: White | | |
|---|---|---|
| | LNGDP$ | LNEMPL |
| Obs. Chi-Square | 0.6293 | 4.7995 |
| Prob. Chi-square | 0.1990 | 0.5379 |

Source: Researcher own compilation and values obtained from EViews.

Reject $H_0$ (of no constant variance, i.e., heteroskedasticity) at 5% level of significance if prob chi-square is larger than 5%, and accept otherwise {that is, if H1 < 5%}. The first model of GDP findings reveal that the likelihood of Chi-squared = 0.1990, as shown in Table 4.4. As a result, the null hypothesis of no heteroscedasticity in the model is rejected since the chi-squared probability is more than 5% of significance, leading to the conclusion that homoscedasticity exists in the first model. However, the results of the second EMPL model suggest that the chi-squared likelihood is 0.5378. Since a result, the null hypothesis of no heteroscedasticity in the model is rejected, since the chi-squared likelihood exceeds the 5% significance level. This indicates that the second model exhibits homoscedasticity, whereas the error term in a regression model remains constant.

**Johansen co-integrated test**

As a result, the null hypothesis that there is no heteroscedasticity in the model is rejected since the chi-squared probability exceeds the 5% significance level. This indicates that in the second model there is homoscedasticity, but in a regression model the error term is constant.

***Table 4.3: Johansen Co-integration Test***

| **Maximum Eigen Test** | | | **Trace Test** | | | |
|---|---|---|---|---|---|---|
| **Max-Eigen statistic** | **5% Critical value** | **Prob*** | **Trace statistic** | **5% critical value** | **Prob*** | **Hypothesis no of CE(s)** |
| 54.5088 | 23.6891 | 0.0002 | 85.1886 | 69.8189 | 0.0018 | None* |
| 19.7682 | 36.5697 | 0.3691 | 30.6797 | 47.8561 | 0.6836 | At most 1 |
| 6.5999 | 23.8957 | 0.8263 | 10.9115 | 29.7971 | 0.9633 | At most 2 |
| 4.1173 | 16.5814 | 0.4869 | 4.3116 | 15.4947 | 0.8769 | At most 3 |
| 0.1943 | 3.58482 | 0.5987 | 0.1943 | 3.8415 | 0.6593 | At most 4 |

Note: Both the Max-Eigen value and the Trace test suggest 1 co-integrating equation at the 0.05 level of significance. (**).

Table 4.5 illustrates the consequences of the Johansen Co-integration Test using Maximum Eigen and Trace Test Statics. The null hypothesis of no co-integration in the first column is rejected at the 5% significance level because the trace and max-Eigen statistics of these tests exceed their critical values. However, because their trace and max-Eigen statistics are less than their essential values, the null hypothesis of no co-integration for the second, third, fourth, and fifth columns cannot be rejected at the 5% significance level. Given the facts, the null hypothesis of no co-integrating equation is rejected at the 5% level. As a consequence, it is found that there is a long-term relationship between economic performance indicators (GDP and employment) and industrial productivity indicators (industrial exports, value added industrial, and production volume) from 2000 to 2020. However, these test results are consistent with their probabilities, as seen by the fact that both the trace and max test statistics provide the same results.

**Regression Analysis**

After validating the presence of a long-term equilibrium relationship between the variables in the regression model, the short-run is transferred to the long-run.

Therefore, from the explanation of model 1 regression results, the GDP projected model in previous section can be scientifically denoted as follows;

$$\Delta LNGDP_t = -0.5766ECT_{t-1} - 0.0778\Delta LNMEXP\$_{t-1} + 0.0392\Delta LNMVA\$_{t-1} - 0.1830\Delta LNPRD\$_{t-1} + \varepsilon_t \ldots. (1)$$

Furthermore, the error correction term coefficient is substantial with the predicted indications and a low magnitude of -0.5766, indicating that the long-term equilibrium is gradually modified if there is any initial duration, with around 57.7 percent of the disequilibrium being eliminated each year. This suggests that, even if there is an initial imbalance of 57.7 percent, Tanzania's rate of response to economic development will eventually return to long-term equilibrium.

Given the lack of significance, it is safe to conclude that an increase in productivity in the industrial sector is not a reliable predictor of GDP growth because the sector is less competitive than other sectors such as agriculture and services, which contribute 28.74% and 37.92%, respectively, compared to the sector's contribution of 25.1% (Plecher, 2020).

The results of multiple determinations (R2) show that the model fits well, with the independent variables explaining 55.62% of the undertaking in the response variable and an adjusted-R2 of 37.13%. The model's overall importance may be described by its F-statistic of 3.0076, which is important at the 5% critical level. The study revealed that the industrial sector's output is statistically significant in accounting for changes in short-term economic growth. Furthermore, the ECT coefficient is important with the predicted results and has a low magnitude of -0.5766, indicating that the long-term equilibrium is gradually modified if there is any initial duration, with approximately 57.7 percent of the disequilibrium eliminated each year. This suggests that, even with an initial 57.7 percent imbalance, Tanzania's rate of responsiveness to economic development will ultimately return to long-term equilibrium.

**Conclusions and Recommendations**

The model's regression results (see table 4.6) revealed that industrial productivity indicators (IVA, IEXP, and PRD) were statistically insignificant, with industrial exports (LNMEXP$) and production volume (PRD) showing an important but weak negative relationship, as a result of limited industrial growth, representing an untapped chance for financial alteration and sustainable GDP group that alleviates poverty. As a result, it is not tempting to depend on simple and logical explanations for Tanzania's economic performance (GDP), because the model's predictor variables do not necessarily indicate an improvement in economic performance. As a result, it may be fair to assume that increasing productivity in the industrial sector is not a rational indicator of GDP growth, as the sector is less competitive in comparison to other contributing sectors, such as agriculture and the service sector, due to the fact that some industries are effective while others remain inactive (Plecher, 2020).

**$H_1$: Industrial value added positively influences GDP**

The causality test results show that industrial value added is bidirectional in causation and has a positive long-run connection with GDP, which supports the prior hypothesis assumption. As a result, a percentage rise in IVA will result in a 0.0392% increase in Tanzania's GDP growth, which is a positive aspect in evaluating economic success. This suggests that a rise in IVA might cause a bigger than proportional increase in Tanzania's GDP growth, even with the presence of a long-run link between the variables, as demonstrated by the co-integration test. This could be attributed to notorious tax systems that limit the expansion of industrial value-added activities, as well as local companies' inability to meet market demand for innovation and differentiation, allowing for increased imports of manufactured value-added goods from

other countries. Consider the following: China, Vietnam, Malaysia, and Europe. These findings contrast Havi's (2014) Ghana research, which discovered that when private-sector lending rose by one percentage point, industrial value added as a proportion of GDP declined by 0.54%, which is statistically important at the 5% level. In accordance with the concept, Wangwe (2014) indicated that the percentage of industrial GDP activities increased by 8% in 2018 over 7.7% in 2017.

**$H_2$: Production volume positively influences GDP**

The causality test results reveal that industrial value added is mutually unidirectional, while having a negative long-term connection, which contradicts the previously stated premise. As a consequence, the regressed findings suggest that a percentage rise in PVP causes a 0.4483% loss in Tanzanian production. This means that a rise in PV is related with a fall in Tanzanian employment due to the existence of a long-run negative connection between the variables, as proven by the co-integration test.

While there is no one cause for the long-term drop in industrial employment, technical improvements, market structure, and job practices make assessing the industry more complex. Such advancements have resulted in significant shifts in the composition of industrial vocations. Textiles, printing, computers, and electrical items now make up a far smaller proportion of industrial employment than in earlier years (Levinson 2019). This result contradicts the findings of Thomas Farole (2017), who discovered that in the latter stages of structural transformation in industrial-oriented economies, such as Turkey, job creation tends to respond fluidly to changes in value added, with a greater upside reaction than a downside reaction since 2000. China, on the other hand, has consistently demonstrated substantial job elasticity in the industrial sectors value-added, in contrast to the considerably weaker link between employment and total economic growth.

**$H_3$: Industrial exports positively influences GDP**

The test results reveal that industrial exports are inversely associated to the unidirectional flow of Gross Domestic Product, which contradicts past expectations. As a result, a percentage rise in industrial exports would lead to a significant decline in Tanzania's GDP growth, as demonstrated by a 7.78% contribution to GDP from 2000 to 2019. This suggests that increased industrial exports result in a proportionate reduction in the country's economic performance.

However, due to poor capacity utilisation rates and a lack of competitiveness, industrial exports have dropped in both absolute and relative terms, with manufactured exports valued at $819.6 million in 2017, down from $1.002 million in 2016. The largest recorded industrial export value since 2010 was $1.3645 million in 2015 (Andreoni, 2017). However, Amon Mbelle and Hafidh Kabanda (2018) agreed with the granger causality test results, stating that IEXP in Tanzania does not granger cause economic performance GDP.

Because the variables have a long-term relationship, a regression analysis using the vector error correlation model was used to determine their significance due to cointegration. In addition, granger causality founded on the VECM was utilised to control the bearing of causality between variables. IEXP and PRD have unidirectional relationships with GDP, but IVA has a bidirectional link with GDP. However, IVA and PRD have an independent relationship, whereas MEXP has a one-way link with employment.

The industrial sector is considered to be important to the wealth of nations as it creates productive employment and sustainable economic growth, making it increasingly clear that industrial is a key factor in achieving the next economic level. Thus, the objective of this study is to evaluate how industrial sector productivity has influenced GDP with respect to GDP and employment in Tanzania given the dynamic economic, structural transformations during the period under review. Specifically, the research examined the impact of industrial productivity indicators (IVA, IEXP and IPRD) on the macro-economic factors. The research suggests the essential to reinforce the established, legal and economic temperature of the manufacturing subdivision in order to recover the keenness of the sector.

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