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Forecasting effects of foreign direct investment on industrialization towards realization of the Tanzania development vision 2025

Harold M. L. Utouh^a  and Felician Andrew Kitole^b 

^aDepartment of Economics, Mzumbe University, Tanzania; ^bInstitute of Development Studies, Mzumbe University, Tanzania

ABSTRACT

Purpose: This paper aims to deepen understanding and knowledge regarding the impact of foreign direct investment (FDI) on the industrialization process. Many developing countries aspire to shift from agriculture-centric economies to achieve sustainable development through industrialization. Realizing this goal, however, has been challenging, prompting an examination of the sixty-year trends and effects of FDI on Tanzania's industrialization trajectory.

Methodology: This study employs a comprehensive approach utilizing time series models, specifically the Vector Autoregressive (VAR) model and the Error Correction Model (ECM), to analyze the dynamic influence of FDI on industrialization. By forecasting the five-year trajectory of industrial growth and FDI inflows using data from the Bank of Tanzania and the National Bureau of Statistics spanning 1960 to 2020, this methodological framework aims to provide a nuanced understanding of the FDI-industrialization relationship, contributing valuable insights to the economic development discourse.

Findings: The study's results highlight the significant role of FDI in shaping both short- and long-term industrial progress, which is critical to advancing Tanzania's industrialization goals. Conversely, factors like exchange rates predominantly impact the short-term industrial landscape. Forecasts from the analysis indicate a projected decline in both FDI and industrialization from 2020 to 2022, followed by a notable upturn from 2022 to 2025. This underscores FDI as a key driver for integrating agriculture-based economies into global value chains, facilitating economic upgrading through capital accumulation—a fundamental catalyst for sustained industrialization.

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1. Introduction

Industrial progress stands as a cornerstone of economic development, driving transformation and growth across nations (Alam et al., 2022). Additionally, the pivotal role of industrialization extends beyond mere economic expansion to encompass the creation of diverse services, employment opportunities, and enhanced competitiveness on a global scale (Boubacar et al. 2024; Lugina et al. 2022). Noteworthy success stories in industrialization, witnessed in countries like Indonesia, China, Taiwan, and the Republic of Korea, underscore the profound impact of industrial development on sustainable economic growth (Ioan et al., 2020).

Despite the global recognition of industrialization's significance, Tanzania's journey towards industrial expansion has faced challenges (Temba et al., 2023). While initiatives such as the Tanzania Development Vision 2025, the Kilimo Kwanza Policy, and the National Trade Policy have been implemented to foster industrial growth (Mutalemwa et al., 2020; Mwakabungu & Kauangal, 2023), the progress has been notably sluggish (Eze et al. 2019). This disparity between efforts and outcomes highlights a critical policy-level problem – the need to accelerate Tanzania's industrialization to align with its development goals and enhance economic prosperity (WB, 2021).

CONTACT Harold M. L. Utouh  hutouh3@gmail.com  Economics Department, Mzumbe University, P.O Box 5, Mzumbe – Tanzania

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In this context, foreign direct investment (FDI) emerges as a potential game-changer for Tanzania's industrialization trajectory. Globally recognized as a significant driver of industrial expansion, FDI facilitates capital inflow, technology transfer, market access, and job creation (Utouh and Tile, 2023). Nations like the United States, Germany, and Japan have leveraged substantial FDI inflows to bolster their manufacturing sectors, showcasing the transformative power of foreign investments in driving economic growth and competitiveness (Geda and Yimer, 2023).

Countries in Asia, such as China, Taiwan, and South Korea, have effectively utilized FDI to propel their industrialization processes, establishing themselves as global manufacturing powerhouses (Mim et al., 2022). Through FDI, these nations have not only nurtured export-oriented industries but also diversified their economies and enhanced technological capabilities (Boubacar et al. 2024). Similarly, African countries like Morocco, Egypt, and South Africa have harnessed FDI in sectors like automotive, textiles, and agro-processing to boost value-added production and economic growth (Li and Tanna, 2019).

Despite the potential of FDI in Tanzania, a critical gap exists in understanding its specific impact on industrial growth. While FDI inflows have shown an upward trend in Tanzania, reaching \$1.1 billion in 2020 (WB, 2021), their influence on the industrial sector remains limited, leading to a reliance on imports and modest GDP contributions (TIC, 2021; Utouh and Tile, 2023). As it has been reported that despite the noteworthy role of FDI in the Tanzanian economy, its specific influence on industrial growth necessitates further investigation (Camino-Mogro et al., 2023). Although, Tanzania has endeavored to attract FDI, particularly in natural resource-dependent industries like mining and gas, there is a crucial need to broaden the scope of FDI to target the manufacturing and agriculture sectors for untapped potential in industrial growth. This gap in research, not only in Tanzania but also in many developing nations, underscores the need for a comprehensive exploration of the dynamics between FDI and industrialization to unlock untapped potential and accelerate economic progress.

Moreover the rest of the paper is structured as follows: [Section 2](#) provides the theoretical underpinnings that guide the study, outlining the relevant economic theories and conceptual frameworks; [Section 3](#) presents a comprehensive review of the existing empirical literature on the relationship between macroeconomic variables and industrial performance; [Section 4](#) details the methodological approach employed in the study, including the data sources, variable selection, and the econometric techniques utilized; [Section 5](#) reports the findings from the empirical analysis; [Section 6](#) provides a critical discussion of the study's key findings, interpreting the results in the context of the existing literature and exploring the economic significance of the relationships uncovered; and [Section 7](#) concludes the paper by summarizing the main takeaways and offering policy recommendations based on the study's findings to inform policymakers and provide guidance for future research and interventions.

2. Theoretical foundation

The current study employs the Solow-Swan growth model, a prominent framework within growth theory, to delve into the intricate relationship between FDI and industrialization within the broader context of economic growth. Originating in the 1950s with Solow's contributions, the growth theory posits that economic growth is driven by the accumulation of external factors of production. Within the realm of industrialization, a theoretical proposition suggests a link between the factors influencing economic growth and the subsequent implications for pivotal economic sectors, particularly industrialization.

At the core of the growth theory framework lies the Cobb-Douglas production function, initially proposed by Hicks (1932). This function constitutes a fundamental component of the aggregate production function, incorporating variables such as capital inputs, technology, exchange rates, and they are influenced by foreign direct investment. These variables exhibit dynamism and temporal fluctuations, wielding substantial impacts on the trajectory of economic growth. FDI assumes a prominent role in augmenting the capital stock, facilitating technology transfer, and influencing crucial economic parameters like exchange rates and trade, thereby molding a nation's industrial performance.

A plethora of empirical studies consistently support the notion that FDI yields positive effects on both economic growth and industrialization. Notably, (Mwakabungu and Kauangal, 2023; Szirmai and Verspagen, 2015) study demonstrates FDI's potential to enhance labor and capital productivity through the introduction of new technologies, resulting in increased returns on investment and fostering labor

growth. Similarly, studies by Boubacar et al. (2024) and Iddrisu et al. (2015) reveal a direct correlation between capital accumulation and output, while Oyegoke and Aras (2021) observe FDI's role in promoting economic growth by facilitating domestic investment. The growth theory underpinning this research contends that FDI plays a pivotal role in nurturing industrial sector growth by augmenting both the quantity and efficiency of investment in the host economy.

Therefore, this research leverages the growth theory framework to explain the interlinked effects of FDI on industrialization in Tanzania. This theoretical lens provides valuable insights into the mechanisms through which FDI contributes to industrial sector growth and enhances overall economic performance. By elucidating the effects of FDI on key economic parameters, the growth theory framework enriches our understanding of the dynamics at play in the symbiotic relationship between FDI and industrialization.

3. Empirical literature

Tanzania's long-term development plan, Vision 2025, aims to transform the country from a least developed to a semi-industrialized middle-income country with a modernized economy and high-quality human capital by 2025. Achieving this vision requires significant investment and economic growth. Foreign direct investment (FDI) has been identified as a key driver of industrialization and economic development in Tanzania.

Studies have consistently shown that FDI has a positive impact on economic growth and industrial development in Tanzania. For instance, a study by Lugina et al. (2022) found that FDI had a positive and significant effect on economic growth in Tanzania from 1970 to 2005, suggesting that attracting more FDI could accelerate Tanzania's industrialization and development. Similarly, Sarker and Khan (2020) found that FDI had a positive impact on manufacturing value added in Tanzania from 1990 to 2012, indicating that FDI can contribute to the growth of the manufacturing sector. However, the effectiveness of FDI in promoting industrialization depends on various factors, such as the type of FDI, the sectors targeted, and the policies in place.

Recent studies have also highlighted the importance of linkages between FDI and local firms for promoting industrialization. Geda and Yimer (2023) found that FDI had positive spillover effects on the productivity of local firms in developing countries, suggesting that encouraging linkages between foreign and local firms could enhance the benefits of FDI for industrialization. Camino-Mogro et al. (2023) showed that vertical FDI (between industries) had a stronger positive effect on economic growth than horizontal FDI (within the same industry), emphasizing the importance of FDI in upstream and downstream industries for promoting industrialization. Additionally, a study by Lugina et al. (2022) highlighted that FDI can bring in new technologies, managerial expertise, and access to global markets, which are essential for upgrading the industrial base of a country.

Utouh et al. (2016), and Matonya (2017) have examined the impact of FDI on Tanzania's industrial sector, aligning with the country's vision to become an industrialized nation by 2025 as outlined in the Tanzania Development Vision 2025. However, these studies present divergent conclusions, highlighting a significant research gap in understanding the nuanced dynamics of FDI and industrialization in Tanzania. On the other hand, Ioan et al. (2020) and Agu and Okoli (2015), emphasize the positive correlation between FDI and industrialization, attributing this to the transfer of knowledge and technology that enhances production efficiency. In contrast, Gui-Diby and Renard (2015) report a negative impact in their panel data study on African countries, introducing a dimension of complexity to the overarching narrative. Njangang et al.'s (2018) investigation into the causality between Chinese FDI and industrialization in Africa reveals a positive but statistically insignificant relationship in some nations, while Jie and Shamshedin (2019) find a positive influence of FDI on industrialization in Ethiopia.

Moreover, a study by Iqbal et al. (2023) emphasized the importance of attracting FDI in high-value-added sectors such as technology-intensive manufacturing and services to drive industrial transformation. By focusing on sectors with high growth potential and value addition, FDI can upgrade the industrial structure and enhance productivity and innovation. Additionally, creating a conducive policy environment is essential for attracting and maximizing the benefits of FDI for industrial development. A study by Guang-wen et al. (2022) highlighted the importance of stable macroeconomic policies, investment incentives, infrastructure development, and regulatory reforms in attracting FDI. By implementing

pro-business policies and addressing infrastructure gaps, a country can create an attractive investment climate that encourages FDI inflows and promotes industrial development.

In addition, a study by Mim et al. (2022) emphasized the need for responsible investment practices, technology transfer, and skills development to maximize the positive impact of FDI on industrial development while minimizing negative social and environmental externalities. By promoting sustainable FDI practices, a country can achieve its development goals while safeguarding the environment and promoting inclusive growth. A study by Ababio et al. (2022) found that FDI can foster technological innovations and improve the productivity rate of foreign inflows. Similarly, Mwakabungu and Kauangal (2023) recommended strong complementarity between FDI and human resources for effective technological transfer. The findings further reveal that the productivity rate of foreign inflows is far greater than local investments, and foreign investment is also a vital tool for technological transfers.

A study by Alam et al. (2022) highlighted the importance of industrial restructuring in the context of FDI. The study found that FDI can lead to industrial restructuring by introducing new technologies, management practices, and organizational structures that can enhance the competitiveness of local firms. Moreover, FDI can also contribute to economic growth, which is essential for industrial development. Baiashvili and Gattini (2020) found that FDI can lead to substantial growth in the countries that depend on foreign sources for investment purposes. The study's findings were like the mainstream literature on the gains of FDI.

Literature has shown contradictory results on the effects of FDI on industrialization due to geographical differences and varying economic conditions across countries (Ababio et al. 2022; Geda and Yimer, 2023; Njangang et al., 2018). To obtain a clear picture of the FDI-industrialization relationship, it is crucial to understand the impacts of FDI at the country level. To fill this gap, the current study explores the effects of FDI on industrialization growth in Tanzania, focusing on the specific context and developmental goals of the country. The study contributes to policy formulation by providing evidence-based insights to guide decision-making towards achieving Tanzania's industrialization vision by 2025. Furthermore, the research adds depth to the empirical literature by offering a comprehensive understanding of the factors influencing industrial development in Tanzania, which can serve as a reference for other developing countries with similar aspirations.

4. Methods and data

4.1. Data authenticity and variable selection

This study utilized data sourced from the Bank of Tanzania and Tanzania Bureau of Statistics, covering the period from 1960 to 2020. The decision to use data from these national sources was driven by the need to avoid potential inaccuracies associated with World Bank data, which are often estimated and may not accurately reflect the reality of economic performances (Giest and Samuels, 2020). Therefore, by relying on data from the Bank of Tanzania and Tanzania Bureau of Statistics, the study ensures that the information used is based on actual economic conditions and activities within the country.

Another reason is the alignment with National Development Agenda as the Tanzania Development Vision 2025 and the Bank of Tanzania share common goals related to monetary policy, financial stability, economic growth, and industrial development (URT, 2016; BOT, 2022). By using data from these national sources, the study aligns itself with the country's development agenda, ensuring that the research findings and policy recommendations are relevant and applicable to Tanzania's specific context. This alignment enhances the validity of the study and increases the likelihood of its findings being adopted and implemented by policymakers.

4.1.1. Selection of economic variables

The selection of economic variables for this study, including industrialization, foreign direct investment (FDI), exchange rate, gross fixed capital formation, inflation rate, and net barter trade, was based on their relevance to Tanzania's national priorities as outlined in the Bank of Tanzania's policies and the Tanzania Industrial Development Plan (BOT, 2022; URT, 2011). These variables were chosen because they are considered crucial factors in driving industrial growth and economic development in Tanzania.

Given that industrialization is the primary focus of this study, as it is a key component of Tanzania's development agenda. The study aims to investigate the impact of FDI and other macroeconomic variables on the country's industrial sector growth. On the other hand, FDI is a crucial variable in this study, as it is widely recognized as a significant driver of industrial expansion, facilitating capital inflow, technology transfer, market access, and job creation (Utouh and Tile, 2023). Understanding the relationship between FDI and industrialization is central to this research.

Additionally, the exchange rate is an important factor in international trade and investment decisions. It can influence the competitiveness of domestic industries and the attractiveness of Tanzania as an investment destination (Roe, 2018; Sarker and Khan, 2020). Including the exchange rate in the analysis allows for a more comprehensive understanding of its impact on industrialization and FDI inflows. Similarly, Gross fixed capital formation, which measures the value of acquisitions of new or existing fixed assets by businesses, is a key indicator of investment in productive capacity (Raphael, 2019). It is included in the study to assess its influence on industrial growth and its relationship with FDI.

Lastly, the inflation rate is a measure of price stability and can have significant implications for economic growth and investment decisions (Lugina et al. 2022). Incorporating the inflation rate in the analysis helps to understand its potential impact on industrialization and FDI inflows. While net barter trade, which measures the purchasing power of exports in terms of imports, is an indicator of a country's terms of trade (WB, 2022). It is included in the study to assess its relationship with industrialization and FDI, as it can influence the competitiveness of domestic industries and the attractiveness of Tanzania as an export destination (Iqbal et al. 2023). Therefore, by selecting these variables based on their relevance to Tanzania's national priorities and their potential impact on industrialization, the study ensures that the analysis is grounded in the country's specific context and development goals. This approach enhances the validity and applicability of the research findings, ultimately contributing to the formulation of effective policies aimed at promoting industrial growth and economic development in Tanzania.

4.2. Model of the study

The study employed a rigorous methodological framework centered on a time-series research design spanning from 1960 to 2020. The selection of a time-series design is strategic, as it facilitates the examination of lagged effects, offering valuable insights into the dynamics of economic variables and their influence on industrial growth over time. This temporal perspective is crucial for delineating the evolving characteristics of FDI, net barter terms of trade, gross fixed capital, inflation, and industrial performance. The utilization of Vector Autoregressive (VAR) and Vector Error Correction Model (VECM) aligns with the research objectives and the nature of the data. VAR models are adept at capturing the interdependencies and dynamic interactions among multiple time-series variables. By incorporating lagged values, VAR enables the exploration of short-term dynamics and relationships between the variables of interest.

Additionally, VECM is instrumental in modeling long-term equilibrium relationships and correcting short-term deviations from this equilibrium. The rationale for employing these models lies in their ability to provide a comprehensive understanding of both short-term fluctuations and long-term trends, capturing the complex relationships among economic parameters. The incorporation of net barter terms of trade, gross fixed capital, inflation, and industrial performance in the model signifies a holistic approach to investigating the diverse factors influencing industrialization in Tanzania. This methodological approach not only ensures the credibility of the findings but also enhances the generalizability of the study's conclusions. The combination of the time-series design and VAR-VECM models forms a robust analytical framework, enabling a nuanced exploration of the intricate network of economic variables and their effects on Tanzania's industrial growth over the past six decades.

4.3. Model estimation

In this study, equation 1 represents the industrial performance function, which is used to explain the rate of industrialization in Tanzania. The equation includes several independent variables: FDI (foreign direct investment), INF (inflation), EXR (exchange rate), NBT (net barter term of trade), and GFCF (gross fixed capital formation). The equation also includes a stochastic term represented by ε_t which captures

the random or unobserved factors that affect industrial performance.

$$INDU_t = f(FDI_t, INF_t, EXR_t, NBT_t, GFCF_t) + \varepsilon_t \quad 1$$

To transform Equation 1 into a linear form, the Cobb-Douglas log-linear model is applied. Equation 2 shows the log-linear form of Equation 1, where each independent variable is raised to a corresponding coefficient α . The term μ_t represents the overall level of industrial performance at time t .

$$INDU_t = \alpha_0 (FDI_t)^{\alpha_1} (INF_t)^{\alpha_2} (EXR_t)^{\alpha_3} (NBT_t)^{\alpha_4} (GFCF_t)^{\alpha_5} \mu_t^{\varepsilon_t} \quad 2$$

To further simplify the equation, it is transformed into natural logarithm in Equation 3. In this equation, the dependent variable $\ln INDU$ represents the natural logarithm of industrial sector growth, and the independent variables are represented by their respective natural logarithms ($\ln FDI$, $\ln INF$, $\ln EXR$, $\ln NBT$, $\ln GFCF$).

$$\ln INDU_t = \alpha_0 + \alpha_1 \ln FDI_t + \alpha_2 \ln INF_t + \alpha_3 \ln EXR_t + \alpha_4 \ln NBT_t + \alpha_5 \ln GFCF_t + \varepsilon_t \quad 3$$

The coefficients α in Equation 3 represent the long-run elasticities of the explained variable, indicating how changes in the independent variables affect industrial sector growth in the long term.

4.4. Stationarity tests (unit root test)

Ensuring the stationarity of time series variables is of utmost importance to avoid misleading regression estimations. To achieve this, a key tool commonly utilized in this study is the Augmented Dickey Fuller (ADF) Test. This widely employed estimator plays a significant role in testing for stationarity and forms an integral part of the current study. Thus, the equation representing ADF Test is given as;

$$\Delta Y_t = \beta_1 + \delta Y_{t-1} + \sum_{i=1}^n \alpha_i \Delta Y_{t-i} + \varepsilon_i \quad 4$$

The hypotheses of equation 4 are as hereby described below,

$H_0 : \delta = 0$ under this assumption the series are found not to be stationary

$H_0 : \delta < 0$ under this alternative hypothesis the series are stationary

4.5. Cointegration test

The cointegration test is a fundamental step in assessing the long-term relationship between variables, especially in time series analysis. In this study, the cointegration test was done using the Johansen Cointegration test, a widely used method that applies maximum likelihood estimation to test for the presence of a cointegrated relationship among multiple time series variables, as described by Johansen (1991). Thus, consider a Vector Autoregressive (VAR) model of vector k , where the variables are integrated at order one (I (1)). The model for the explained variable Y_t can be written as:

$$Y_t = A_t Y_{t-1} + A_t Y_{t-2} + \dots + A_k Y_{t-k} + \varepsilon_t \quad 5$$

Whereas Y_t and ε_t are the $n \times 1$ vectors. Thus, Equation 5 can be rewritten as

$$\Delta Y_t = \sum_{i=1}^{k-1} \omega_i Y_{t-i} + \Pi Y_{t-1} + \mu_0 + \varepsilon_t \quad 6$$

Whereas $\omega_i = -\sum_{j=i+1}^k A_j$ and $\mu_0 = \sum_{i=1}^k A_i - 1$. If there are r cointegrating relationships, ω_i and individual columns of β become the adjustment parameters in the Vector Error Correction Model (VECM), where $\beta' Y_t$ is stationary.

4.6. Vector error correction model (VECM)

The Vector Error Correction Model (VECM) was employed to capture both the long-run and short-run dynamics. The VECM is an extension of the VAR model and is suitable for handling non-stationary

variables while exploring the short-term adjustments to long-term equilibrium. Therefore, the cointegration equation can be specified in the VECM as:

$$\Delta \ln INDUL_t = \alpha_0 + \sum_{i=1}^n \theta \Delta \ln INDUL_{t-1} + \sum_{i=1}^n \psi \Delta \ln EXR_{t-1} + \sum_{i=1}^n \eta \Delta \ln FDI_{t-1} + \sum_{i=1}^n \lambda \Delta \ln INF_{t-1} + \sum_{i=1}^n \partial \Delta \ln GFC_{t-1} + \sum_{i=1}^n \Omega \Delta \ln NBT_{t-1} + \aleph ECT_{t-1} + \varepsilon_t$$

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Moreover, the coefficient of error correction term ECT_{t-1} in Equation 7 is presented by $\aleph$.

4.7. Short-run impact of FDI

To investigate short-run effects of foreign direct investment on industrial sector growth, thus equation 7 was later transformed to equation 8:

$$\ln INDUL_t = \beta_0 + \sum_{i=1}^n \beta_1 \ln INDUL_{t-1} + \sum_{i=1}^n \beta_2 \ln EXR_{t-1} + \sum_{i=1}^n \beta_3 \ln FDI_{t-1} + \sum_{i=1}^n \beta_4 \ln INF_{t-1} + \sum_{i=1}^n \beta_5 \ln GFC_{t-1} + \sum_{i=1}^n \beta_6 \ln NBT_{t-1} + \varepsilon_t$$

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5. Results

Results presented in Table 1 provide insights into Tanzania's industrial growth and economic indicators over the past six decades. The average annual industrial growth rate (INDUL) stands at a respectable 8.358%, with the lowest recorded growth of 5.534% in 1988 and the highest of 10.983% in 1998. This data suggests that Tanzania's industrial sector has experienced significant fluctuations in growth rates during the study period. Regarding foreign direct investment (FDI), the average inflow rate was 2.427% from 1960 to 2020. The lowest FDI rate of 0.0002% was recorded in 1990 and 1991, while the highest rate of 5.664% occurred in 2010. These figures indicate that FDI inflows have been volatile, with periods of low investment followed by periods of higher investment.

The average exchange rate (EXR) between the US dollar and Tanzanian shilling (Tshs) stands at 1120.515 Tshs per US dollar over the study period. The lowest recorded rate was 7 Tshs per US dollar in 1960, reflecting a relatively higher value of the Tanzanian currency compared to the US dollar during that year. Conversely, the highest rate reached 2294 Tshs per US dollar in 2020, indicating the lowest value of the Tanzanian shilling relative to the US dollar from 1960 to 2020. Moreover, the average growth rate of gross fixed capital formation (GFC) has been a promising 7.94%. However, both inflation rate (IFL) and net barter terms of trade (NBT) experienced significant fluctuations, with inflation averaging 13.0708% and net barter terms of trade standing at 122.6003 during the study period.

Figure 1 illustrates the necessity of including a drift term when testing for stationarity, as the variables attain stationarity only when the drift is included. Furthermore, the figure suggests that the Exchange Rate (EXR) and Gross Fixed Capital Formation (GFC) variables might not exhibit stationarity, warranting further examination using the Augmented Dickey Fuller test.

Table 1. Descriptive statistics.

Variables	Code	Mean	Standard deviation	Min	Max
Industrialization	INDUL	8.358356	1.279706	5.533934	10.98306
Foreign direct investment	FDI	2.427803	1.573654	0.0002	5.663728
Exchange rate	EXR	1120.515	680.7785	7	2294
Gross fixed capital formation	GFC	7.940009	7.840009	1.0300	2.680010
Inflation	IFL	13.07085	10.09688	3.290291	35.82677
Net barter of trade	NBT	122.6003	25.08858	95.28302	169.2197

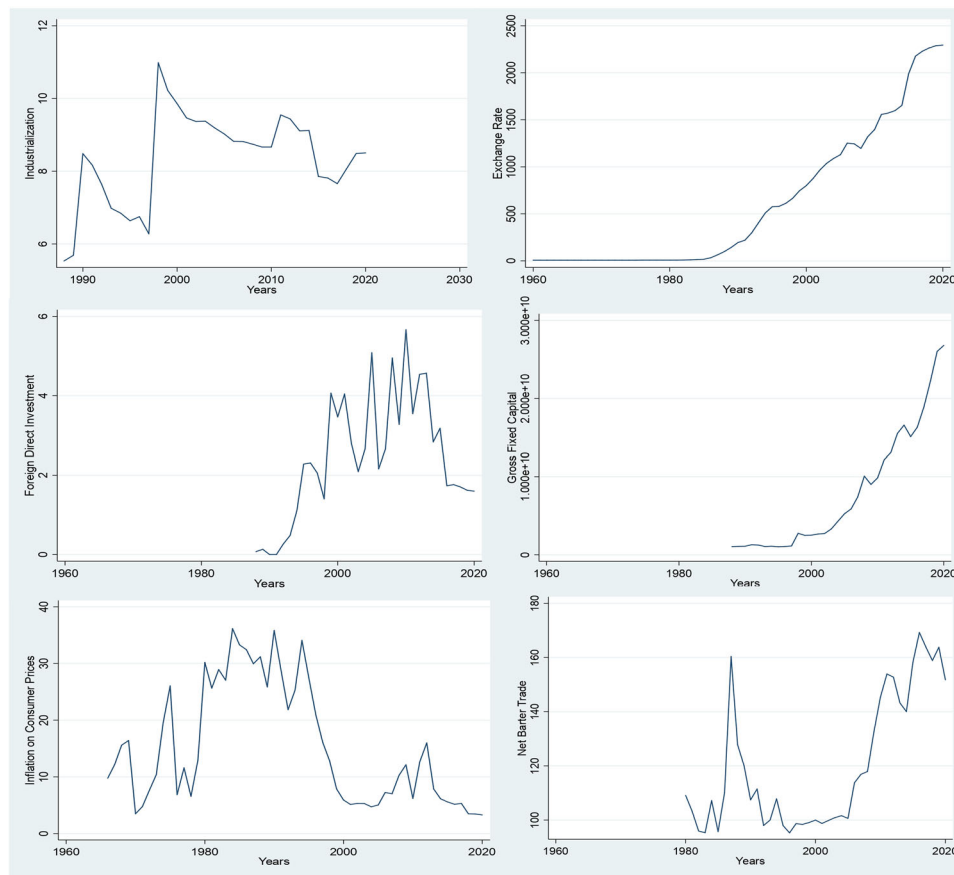


Figure 1. Trend analysis.

Table 2. Dickey fuller tests for stationarity.

Variables (drift lags (0))	p-value for Z(t)	Test statistic	Interpolated dickey-fuller		
			1% Critical value	5% Critical value	10% Critical value
IFL	0.0201	-3.251	-1.755	-1.284	-0.952
FDI	0.0125	-2.106	-3.677	-2.165	-2.001
INDUL	0.0482	-3.283	-3.838	-2.892	-2.116
NBT	0.0052	-4.874	-4.268	-3.527	-2.451
GFC	0.3144	5.003	-4.268	-3.527	-2.451
EXR	0.1083	-1.002	-6.728	-5.607	-4.305
Variables transformation					
D.GFC	0.0083	-5.852	-4.619	-3.006	-1.705
D.EXR	0.0000	-6.017	-8.105	-5.321	-3.097

5.1. Unit root and structural break testing

In this study, a unit root test was conducted to assess the presence of unit roots in the time series data. The presence of unit roots can indicate non-stationarity, which can lead to spurious regression results. To test for unit roots, the Augmented Dickey-Fuller (ADF) test was employed. Table 2 presents the detailed results of the unit root test for each variable, including the test statistics and their corresponding critical values at different significance levels (1%, 5%, and 10%). The results in Table 2 reveal that the variables foreign direct investment (FDI), net barter terms of trade (NBT), inflation (INF), and industrial performance (INDUL) were found to be stationary at their level, as the test statistics for these variables were less than their respective critical values. This suggests that these variables do not exhibit non-stationarity and can be used in further analysis without transformation.

However, the exchange rate (EXR) and gross fixed capital formation (GFC) exhibited non-stationarity at their levels, as the ADF test statistics exceeded the critical values. This indicates that these variables require transformation to achieve stationarity. To address the issue of non-stationarity, first-order

Table 3. Zivot-Andrews test results.

Variables	p value	Test statistic	Critical Values			Results
			5%	1%	10%	
FDI	0.5243	−2.941	−4.203	−3.852	−4.853	No Break
IFL	0.1680	−1.773	−2.611	−2.442	−3.783	No Break
NBT	0.2914	−0.377	−0.517	−1.008	−2.092	No Break
INDUL	0.3302	−1.078	−3.925	−2.921	−4.892	No Break

Table 4. Lag order selection criteria.

Lag	LL	LR	df	P-Value	FPE	AIC	HQIC	SBIC
0	−9742.81				17.56734	92.64232	92.95581	93.00642
1	−2456.21	509.11	22	0.011	14.54181	85.00160	86.34110	89.50882
2	−2142.09	217.03*	22	0.011	9.00721*	79.11022*	83.78011*	86.22671*

differencing was applied to the non-stationary variables. The differenced variables (ΔEXR and ΔGFC) were then tested for stationarity using the ADF test. The results showed that the differenced variables became stationary, as the ADF test statistics were now below the critical values (see Table 2). This transformation ensures that the variables are suitable for further analysis, mitigating the risk of spurious regression results.

Table 3 presents results for the structural breaks in the time series data, which can signify abrupt and enduring shifts in variable behavior triggered by external shocks, policy alterations, or other impactful events. To identify such structural breaks, the Zivot-Andrews test was utilized. The results reveal that there is no substantial evidence of structural breaks in the variables under scrutiny. The P-values for FDI, inflation (IFL), net barter terms of trade (NBT), and industrial performance (INDUL) stand at 0.5243, 0.1680, 0.2914, and 0.3302, respectively, all exceeding the conventional significance level of 0.05 (5%). The corresponding test statistics for FDI, IFL, NBT, and INDUL are −2.941, −1.773, −0.377, and −1.078, respectively. These statistics are less extreme than the critical values at the 5%, 1%, and 10% significance levels, providing robust evidence that no significant structural breaks exist in the time series data for these variables. Consequently, the time series data pertaining to FDI, IFL, NBT, and INDUL can be considered relatively stable, with no notable shifts in trend or level observed over time. This stability suggests a consistent behavior in these variables, indicating a lack of significant disruptions or changes in their underlying patterns throughout the study period.

The lag order selection criteria results are presented in Table 4 to determine the most suitable lag order for the cointegration model. Among the considered lag orders (0, 1, and 2), the criterion suggests that the second lag order (2) is the most appropriate for the cointegration model. This selection is based on the highest log-likelihood value (−2142.09) and the lowest values for Final Prediction Error (FPE) (9.00721) and Akaike Information Criterion (AIC) (79.11022), indicating better goodness of fit and model performance. Furthermore, the Sequential Modified LR Test Statistic supports the selection of the second lag order with a significant test result ($p < 0.05$), providing evidence of cointegration between the variables. This significant test result implies that there exists a long-run equilibrium relationship among the variables in the model. Given the superior performance of the second lag order based on the selection criteria and the evidence of cointegration, this lag order will be utilized to conduct further analyses and inferences in the cointegration model. The selection of the appropriate lag order is crucial for ensuring the reliability and accuracy of the cointegration analysis, as it captures the dynamic relationships among the variables over time. By incorporating the second lag order, the cointegration model will be able to account for the lagged effects of the variables on each other, providing a more comprehensive understanding of their long-run relationships. This information is essential for drawing meaningful conclusions about the factors influencing the variables of interest and their interactions in the context of the study.

The results presented in Figure 2 corroborate the findings presented in Table 4, highlighting that the optimal lag order is at lag two, as shown in column 3. The observed movements in the variables illustrate the variations in their changes under different integrations. Notably, positive shocks to these variables lead to a surge in industrialization, but this effect tapers off after the 7th or 8th period. These insights emphasize the importance of considering the appropriate lag order in the analysis to capture the dynamic relationships accurately.

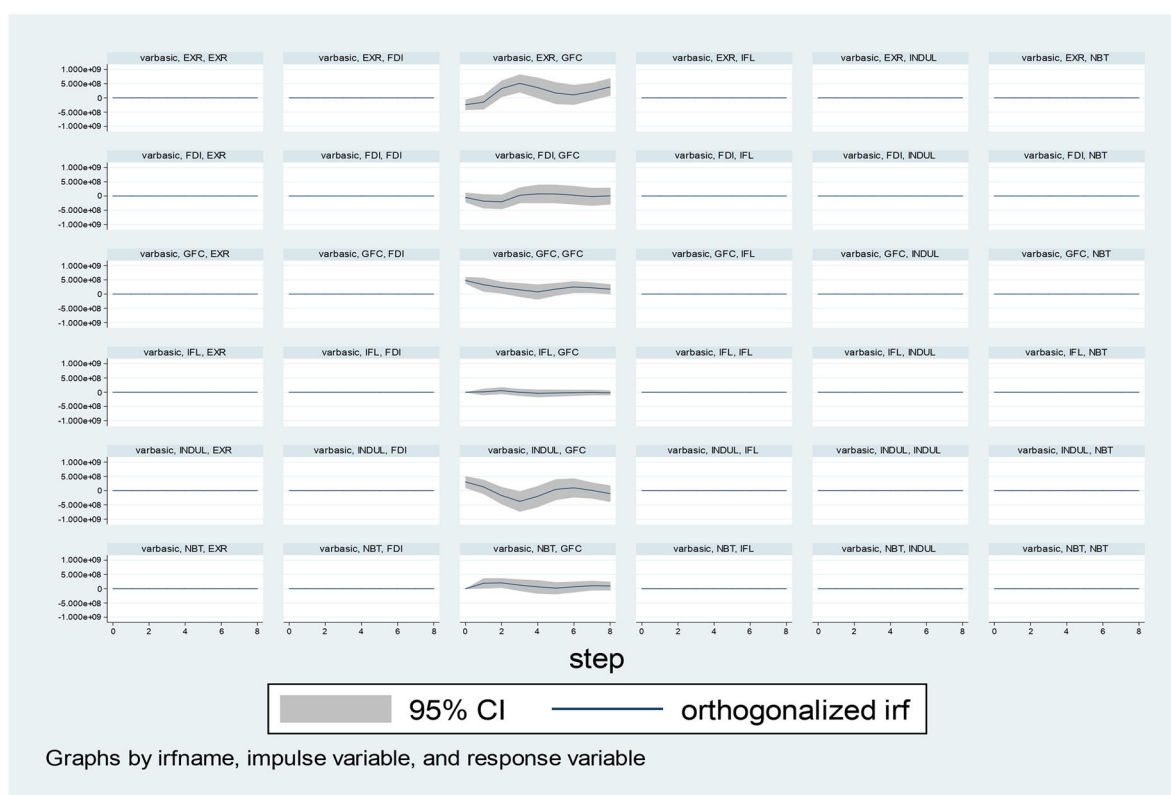


Figure 2. Irf graph (shocks in variables).

Furthermore, the Johansen Cointegration Test results in Table 5 indicate five cointegrating relationships among the variables, suggesting a stable long-run connection. The trace and likelihood ratio statistics exceed critical values up to rank 5, confirming the presence of cointegration. Beyond rank 5, the statistics drop to zero and become negative, implying no further cointegration.

5.2. Time series regression results

The vector autoregression (VAR) results in Table 6 present the long-run effects of foreign direct investment (FDI), exchange rate (EXR), gross fixed capital formation (GFC), inflation (IFL), and net barter terms of trade (NBT) on industrial sector performance (lnINDUL) in Tanzania. The coefficients represent the estimated impact of each variable on industrialization over time. For instance, the lagged values of industrial sector performance (lnINDUL) are positively associated with the current values, suggesting a positive relationship between past and present industrial performance.

Notably, FDI exhibits a positive and statistically significant impact on industrial sector growth, both in its current and lagged forms. This suggests that increased FDI contributes to the expansion of the industrial sector in Tanzania. Similarly, the exchange rate shows a significant positive effect on industrialization, indicating that favorable exchange rate conditions foster industrial growth. Gross fixed capital formation also positively influences industrial performance, indicating that increased investment in fixed capital enhances industrial development. These findings are similar to studies (Fauzel et al., 2015), which argued that FDI is necessary for industrial growth in most of developing countries.

In contrast, inflation shows a mixed impact, with the lagged values being negatively associated with industrialization. This implies that higher past inflation may have adverse effects on present industrial growth (Eze et al., 2019). However, the current inflation rate does not show a significant impact on industrial performance. Net barter terms of trade have a positive effect on industrialization, meaning that favorable terms of trade contribute to industrial sector growth.

Table 5. Johansen cointegration test.

Maximum rank	parms	LL	eigenvalue	Trace statistic	5% Critical Value	1% Critical Value
0	42	−1123.8502		104.3243	94.15	103.18
1	53	−1099.8989	0.78674	56.4216*1*5	68.52	76.07
2	62	−1085.9875	0.59242	28.5988	47.21	54.46
3	69	−1077.8472	0.40855	12.3183	29.68	35.65
4	74	−1073.8057	0.22952	4.2352	15.41	20.04
5	77	−1071.6881	0.12770	0.0000	3.76	6.65
6	78	−1071.6881	−0.0000			

Maximum rank	parms	LL	eigenvalue	Trace statistic	5% Critical Value	1% Critical Value
0	42	−1123.8502		47.9027	39.37	45.10
1	53	−1099.8989	0.78674	27.8227	33.46	38.77
2	62	−1085.9875	0.59242	16.2805	27.07	32.24
3	69	−1077.8472	0.40855	8.0831	20.97	25.52
4	74	−1073.8057	0.22952	4.2352	14.07	18.63
5	77	−1071.6881	0.12770	0.0000	3.76	6.65
6	78	−1071.6881	−0.00000			

Table 6. Long run effects of FDI to industrialization.

Variables	(1) lnINDUL	(2) lnFDI	(3) lnEXR	(4) lnGFC	(5) lnIFL	(6) lnNBT
L.lnINDUL	0.20921 (0.16091)	0.44612 (0.29051)	−0.35337 (0.19449)	−0.35614 (0.19703)	−0.16632 (0.29003)	0.44088 (0.28119)
L2.lnINDUL	0.33771 (0.21688)	0.22691*** (0.00781)	0.29772 (0.15952)	0.33007 (0.44018)	0.26255 (0.17045)	−0.44913*** (0.09336)
L.lnFDI	0.37091*** (0.00167)	0.42249*** (0.01018)	0.17225 (0.09667)	−0.11552 (0.09736)	0.24778 (0.16995)	−0.14733 (0.09884)
L2.lnFDI	0.30221** (0.00563)	0.38119*** (0.00172)	−0.27733*** (0.00162)	0.28055 (0.19054)	−0.31073 (0.19225)	−0.10882 (0.09556)
L.lnEXR	−0.44218 (0.29710)	−0.32072 (0.18994)	0.16422*** (0.00013)	−0.22046 (0.18502)	0.22892 (0.15339)	0.40056 (0.29443)
L2.lnEXR	0.19336 (0.22702)	0.27431*** (0.00211)	−0.33553 (0.19441)	0.22071 (0.24074)	−0.28255 (0.18332)	−0.37228 (0.19664)
L.lnGFC	0.27335 (0.30661)	0.19428 (0.21482)	0.21556 (0.19339)	0.42251*** (0.00531)	0.19795 (0.20911)	−0.11944 (0.26337)
L2.lnGFC	−0.24229 (0.20566)	−0.16885** (0.00951)	−0.23261 (0.30115)	−0.23944 (0.17322)	−0.42274 (0.33117)	0.33667*** (0.00216)
L.lnIFL	0.16094* (0.04770)	0.37031*** (0.01533)	−0.11503* (0.01634)	−0.13260 (0.07561)	0.31198*** (0.00731)	0.26341 (0.15779)
L2.lnIFL	0.27169 (0.17063)	0.52710*** (0.00315)	0.10443 (0.07552)	0.24221 (0.19542)	−0.09668 (0.22861)	0.21904 (0.17984)
L.lnNBT	0.38301*** (0.04181)	0.27991*** (0.01241)	0.25398 (0.18226)	0.31650 (0.20121)	0.13664 (0.09773)	0.26044*** (0.00001)
L2.lnNBT	−0.39862 (0.21632)	−0.40610*** (0.00523)	−0.45511 (0.32091)	−0.10883 (0.20740)	−0.18753 (0.153207)	−0.26339*** (0.01892)
Constant	0.87320*** (0.00331)	0.26198* (0.07411)	0.36915 (0.27118)	0.53291*** (0.07321)	0.15443 (0.23625)	0.347983 (0.19312)
Model strength						
AIC			−9.03328			
HQIC			−7.29171			
SBIC			−5.39817			
Log likelihood			224.0162			
FPE			4.04417			

Standard errors in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The model strength is supported by the statistical significance of the coefficients and the relatively low values of AIC, HQIC, and SBIC, indicating a good fit of the model. However, it is essential to consider the standard errors in parentheses to assess the precision of the estimates. Overall, these findings suggest that FDI, exchange rate, gross fixed capital formation, inflation, and net barter terms of trade are essential factors influencing industrial sector growth in Tanzania. These results have significant implications for policymakers seeking to promote industrial development and economic growth in the country.

The VAR estimation in this study required the variables to be on a similar scale or in a transformed form, which was achieved by converting them into their natural logarithms. As a result, the Impulse Response Function (IRF) graph presented in [Figure 3](#) depicts the response of variables that are 100 times

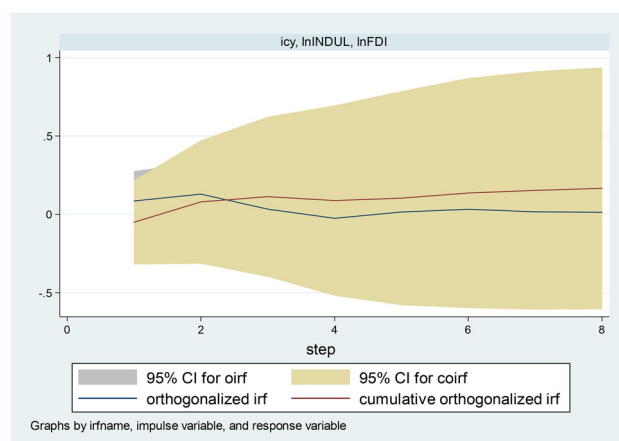


Figure 3. IRF graph on impulse and variables' response.

larger than the original variables when the original variables are multiplied by 100. This scaling enables a clearer visualization of the effect of an unanticipated upward unit change in the impulse variables on the response variable over the next eight periods. The IRF shows the expected levels of shocks in a given period, and the 95% confidence interval encompasses the highest and lowest estimates, providing valuable insights into the magnitude and direction of the responses.

Results in Table 7 present the estimated coefficients of the short-run relationship between the studied macroeconomic parameters in Tanzania. The findings reveal that the error correction term (ECT) coefficient (-0.18089) is statistically significant at the 1% level, indicating that the model has a strong adjustment mechanism to correct deviations from the long-run equilibrium between the variables. It means that in the short run, if there is a deviation from the long-run equilibrium, the system will adjust at a speed of approximately -0.18 , and this adjustment is statistically significant.

On the other hand, foreign direct investment has a statistically significant positive effect on industrialization, with a coefficient of 0.24002 . This suggests that, in the short run, an increase in FDI positively impacts industrial sector performance. On the other hand, exchange rate has a positive effect on industrialization with a coefficient of 0.16552 , which indicates that a favorable exchange rate also contributes to industrial growth in the short term. However, the other variables, gross fixed capital formation, inflation, and net barter term of trade, do not show statistically significant impacts on industrialization in the short run.

5.3. Model specification and assumptions tests

5.3.1. Lagrange multiplier (LM) test

The results of the Lagrange Multiplier (LM) test for autocorrelation at different lag orders are presented in Table 8. The LM test is used to check for the presence of autocorrelation in the model residuals. The null hypothesis (H_0) being tested is 'no autocorrelation at the specified lag order'. At lag order 1, the LM test statistic is 42.1321 , and the corresponding p-value is 0.22276 . Since the p-value (0.22276) is greater than the conventional significance level of 0.05 (5%), we fail to reject the null hypothesis. This indicates that there is no significant evidence of autocorrelation in the model residuals at lag order 1.

Moreover, at lag order 2, the test statistic is 48.1888 , and the p-value is 0.08425 . Again, the p-value is greater than 0.05 , leading to the failure to reject the null hypothesis at lag order 2. Hence, there is no significant autocorrelation in the model residuals at this lag order as well. Therefore, based on the LM test results, we find no evidence of significant autocorrelation in the model residuals at lag orders 1 and 2. This suggests that the model's specification is adequate in capturing the relationship between the variables, and the assumption of no autocorrelation in the residuals holds.

5.3.2. The VECM stability analysis

Results in Table 9 show the eigenvalues and their corresponding moduli for the companion matrix used in the VECM stability analysis. The stability analysis is performed to check whether the VECM model is stable and satisfies the stability condition.

Table 7. VECM results with short run dynamics.

Variables	Coefficients	p-Value	[95% Confidence Interval]	
ECT	−0.18089*** (0.00001)	0.000	−0.15042	0.06022
L1.	−0.21031 (0.13866)	0.274	−2.0012	−0.00321
lnFDI	0.24002*** (0.00010)	0.000	0.42881	1.00321
lnEXR	0.16552** (0.01279)	0.013	0.10331	0.62199
lnGFC	0.34852 (0.19921)	0.189	0.34177	0.99623
lnIFL	−0.16072 (0.09166)	0.232	−0.24045	0.09560
lnNBT	0.22082 (0.16001)	0.418	0.25771	0.92441
Model strength				
AIC		−26.74210		
HQIC		−16.49052		
SBIC		−14.50118		
Log likelihood		218.6044		

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Standard errors in parentheses.

Table 8. Lagrange multiplier test.

Lag	Chi Square	df	Prob > Chi Square
1	42.1321	36	0.22276
2	48.1888	36	0.08425

H_0 : No autocorrelation at lag order.

Table 9. Companion matrix for eigenvalue stability condition.

Eigenvalue	Modulus
1	1
1	1
1	1
1	1
1	1
0.74824900	0.748249
−0.01433592	+ 0.5915680i
−0.01433592	− 0.5915680i
−0.21515860	+ 0.3337601i
−0.21515860	− 0.3337601i
0.16465150	0.164651
0.12130120	0.121301

The VECM Specification imposes five-unit moduli.

In a VECM model, the eigenvalues of the companion matrix should have moduli less than or equal to 1 for the model to be stable. From the table, we observe that all the eigenvalues have moduli less than 1, indicating that the VECM model satisfies the stability condition. The VECM specification imposes five-unit moduli, which means that there are five eigenvalues with a modulus equal to 1. These unit eigenvalues represent the cointegrating relationships in the VECM model, indicating the long-run equilibrium among the variables. Overall, the stability analysis confirms that the VECM model is stable and appropriate for the data, and the cointegrating relationships are well-defined in the model.

Figure 4 displays the Roots of Companion Matrix, offering valuable insights into the model's stability. The plot showcases the eigenvalues, where the real component is on the x-axis and the imaginary component is on the y-axis. Notably, the root with a modulus of 0.95 is particularly essential, as it reflects the proximity of the model to the unit circle. By visually assessing this relationship, therefore, this confirms the stability of the model, reinforcing its reliability and appropriateness for the data used in the study.

5.3.3. Johansen normalized test

The Johansen normalized restriction result in Table 10 shows that the Vector Error Correction Model (VECM) used to examine cointegration relationships among the variables has yielded significant and meaningful findings. The coefficients for each variable have been estimated, and the Z-statistics and p-values have been

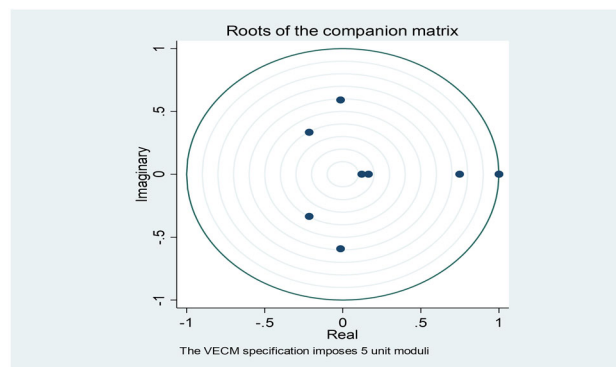


Figure 4. Eigenvalue stability condition.

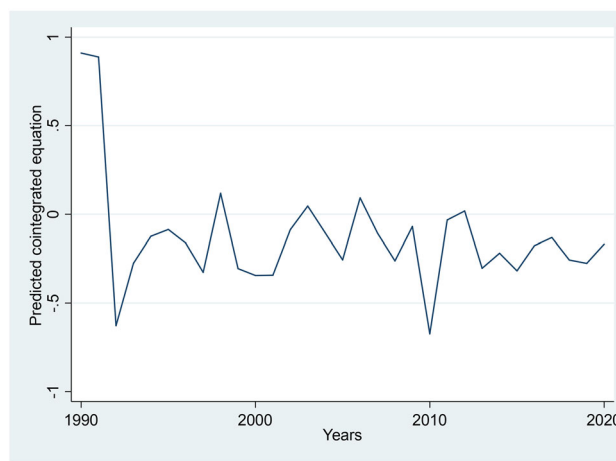


Figure 5. Predicts cointegrated equation.

calculated to determine the significance of these coefficients. For the $\ln FDI$, the coefficient is 0.2880746, and the Z-statistic is 20.33 with a remarkably low p-value at 1%, indicating strong evidence of cointegration.

Similarly, $\ln EXR$ exhibits a coefficient of 1.71779, with a Z-statistic of 15.78 and a p-value at 1%, providing further evidence of cointegration. Moreover, $\ln GFC$ and $\ln IFL$ also demonstrate significant relationships with the other variables, as evidenced by their Z-statistics of -3.65 and 9.05, respectively, both with p-values at 1%. The negative coefficient of -0.280848 for $\ln GFC$ implies an inverse relationship, while $\ln IFL$'s coefficient of 0.5320755 indicates a positive relationship. Furthermore, the $\ln NBT$ exhibits a significant negative relationship, with a coefficient of -1.750596 and a Z-statistic of -5.98, both with a p-value at 1%. Overall, the Johansen normalized restriction test supports the presence of cointegration among the variables in the VECM, suggesting long-run relationships among these variables. The small p-values indicate that the null hypothesis of no cointegration is rejected for all variables except $\ln INDUL$, which is restricted to having a unit coefficient.

5.4. Forecasting FDI and industrialization in Tanzania

Figure 6 illustrates the projected industrial performance (industrialization) in Tanzania from 2020 to 2025. The analysis reveals that there will be gradual and modest growth from 2021 to 2022. Subsequently, industrial performance is expected to gain momentum, with a more significant growth rate anticipated from 2022 to 2023. Beyond 2023, the industrial performance is projected to maintain a consistent and steady growth trajectory until 2025. These findings indicate a positive outlook for the industrial sector in Tanzania, suggesting sustained growth and development over the forecasted period.

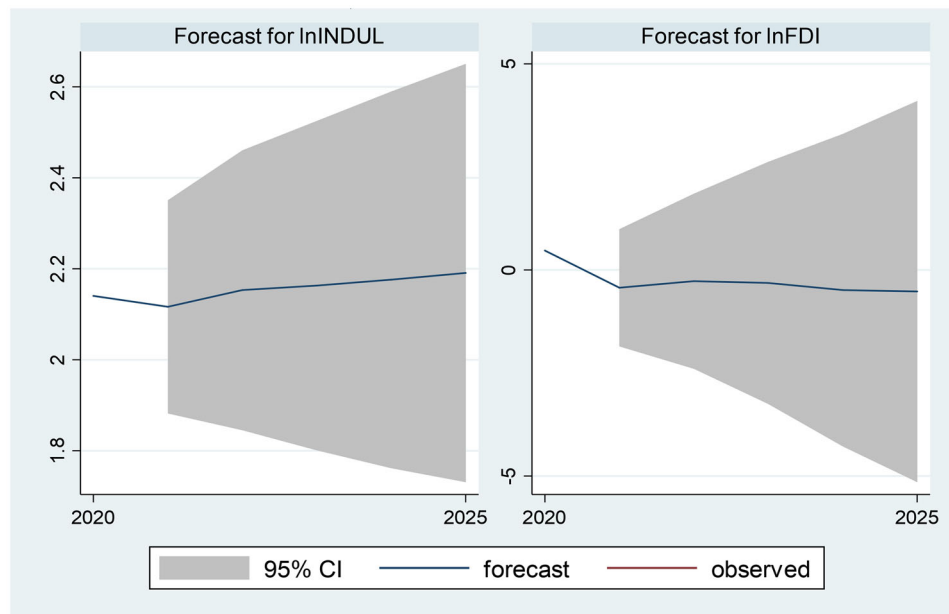
Moreover, results in Figure 6 show that from 2020 to 2021, FDI experienced a decline, indicating a temporary setback in foreign investment inflows. However, starting in 2022, FDI shows signs of recovery and begins to rise gradually until 2025. It is worth noting that the growth rate of FDI during this period

Table 10. Johansen normalized restriction.

Variables	Coefficients	Z	p-Value	[95% Confidence Interval]	
InINDUL	1				
InFDI	0.2880746*** (0.0141676)	20.33	0.0000	0.2158426	2.603065
InEXR	1.71779*** (0.10888931)	15.78	0.0000	1.504364	1.931217
InGFC	-0.280848*** (0.0770247)	-3.65	0.0000	-0.4318136	-0.1298824
InIFL	0.5320755*** (0.0587825)	9.05	0.0000	0.4168639	0.6472871
InNBT	-1.750596*** (0.2928611)	-5.98	0.0000	-2.324593	-1.176599

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Standard errors in parentheses.

**Figure 6.** Projection of Tanzania's FDI and Industrial growth 2020-2025.

remains relatively low, with a gentle slope compared to the industrial sector's growth. This observation suggests that despite the industrial sector's positive performance, FDI's contribution to overall growth during the specified five-year period is relatively modest.

6. Discussion

The positive and statistically significant impact of foreign direct investment (FDI), both in its current and lagged forms, highlights the pivotal role of foreign investment in stimulating sustained industrial development. This finding aligns with established studies emphasizing the necessity of FDI for industrial growth in developing countries (Lugina et al., 2022). The results imply that FDI can be a crucial factor in fostering industrial development, particularly in emerging economies where access to capital and technology can be limited (Temba et al., 2023). This suggests that policymakers should prioritize policies that attract and retain foreign investment, such as offering incentives for multinational corporations and creating a favorable business environment.

The influence of a favorable exchange rate on industrialization resonates with the consensus that currency stability fosters industrial growth, underscoring the importance of exchange rate policies in promoting industrial development (Lugina et al., 2022). Additionally, the positive relationship between gross fixed capital formation and industrial performance reaffirms the widely acknowledged phenomenon that substantial investment in fixed capital, including infrastructure and technology, is essential for sustained

industrial growth (Poncian and Kigodi, 2018). The results imply that a stable exchange rate can facilitate investment in fixed capital, which in turn supports industrial growth. Therefore, policymakers should maintain a stable exchange rate to create a conducive environment for investment and industrial development (Li and Tanya, 2019).

However, the impact of inflation, with lagged values negatively associated with industrialization, adds complexity to the relationship. This finding aligns with studies suggesting that past inflationary pressures may hinder present growth (Poncian and Kigodi, 2018). The discussion around the role of inflation in industrialization is consistent with the broader debate in the literature, where some argue for the positive effects of moderate inflation while others emphasize the importance of price stability (Camino-Mogro et al., 2023). The results imply that inflation can have a negative impact on industrial development if not managed effectively hence policymakers should implement policies to control inflation and maintain price stability to ensure sustained industrial growth (Roe, 2018).

The positive influence of favorable net barter terms of trade on industrialization underscores the crucial role that external trade conditions play in economic development. This suggests that a favorable terms-of-trade environment contributes positively to industrial sector growth (Li and Tanya, 2019). The results imply that a favorable trade environment can boost industrial growth by increasing the availability of goods and services, therefore, policymakers should focus on improving trade conditions to enhance industrial development (Njangang et al., 2018; Oyegoke and Aras, 2021).

In addition, the findings emphasize the intricate nature of short-run dynamics in the relationship between macroeconomic variables and industrialization, suggesting that certain factors may not yield immediate results but could play pivotal roles in shaping industrial growth over an extended period (Oyegoke and Aras, 2021; Roe, 2018). Understanding these short-run dynamics is vital for policymakers, informing them of the urgency and effectiveness of interventions. The statistically significant ECT coefficient emphasizes the need for swift corrective measures to maintain equilibrium. In response to short-term economic shocks, policymakers may need to implement targeted policies to attract FDI, stabilize exchange rates, and address immediate challenges (Agu and Okoli, 2015; Iddrisu et al., 2015; Jie and Shamshedin, 2019). The non-significant short-run impacts of certain variables imply that policymakers should adopt a nuanced approach, balancing short-term measures with long-term strategies (Eze et al., 2019; Fauzel et al., 2015). The results imply that policymakers must be prepared to adapt to changing economic conditions and implement policies that address immediate challenges while also fostering long-term growth.

To facilitate improvements in industrial sector performance, a country may consider adopting a flexible exchange rate policy. A flexible exchange rate allows the currency to adjust based on market forces, providing the necessary flexibility for economic adjustments. This approach can help the country maintain competitiveness in international trade, attract foreign direct investment, and manage economic shocks effectively. By allowing the exchange rate to respond to market conditions, policymakers can create a conducive environment for industrial growth as the currency's value aligns with economic fundamentals. This flexibility enables the country to navigate global economic changes and enhances the resilience of its industrial sector. The results imply that a flexible exchange rate policy can be an effective tool for policymakers to manage economic fluctuations and promote industrial development.

7. Conclusion

This study investigates the intricate relationship between foreign direct investment (FDI) and industrial performance in Tanzania. The findings illuminated a robust and enduring connection between FDI and industrialization, emphasizing the pivotal role of foreign investment in driving Tanzania's industrial growth. Notably, the positive and statistically significant impact of FDI on industrial performance underscores its immediate influence, highlighting the potential for accelerated growth with increased FDI inflows. Beyond FDI, other economic factors like exchange rates, inflation, gross fixed capital formation, and net barter terms of trade were identified as influencers of industrial performance.

Based on these insights, policy recommendations are crafted to fortify sustainable industrialization and attract enhanced FDI inflows. First the study informs policy on managing exchange rate fluctuations and ensure they positively influence industrialization; Tanzania can consider implementing a managed

float exchange rate system. This mechanism allows the exchange rate to fluctuate within a predetermined range, providing flexibility while preventing excessive volatility. Additionally, the government can intervene in the foreign exchange market when necessary to stabilize the exchange rate and support industrial competitiveness.

Secondly, controlling inflation is crucial for maintaining macroeconomic stability and fostering industrial growth. Tanzania can employ monetary policy tools, such as adjusting interest rates and managing money supply, to curb inflationary pressures. By maintaining price stability, the government can create a favorable environment for investment, reduce uncertainty, and support sustainable economic development. On the other hand, to enhance the net barter of trade and promote value-added production in Tanzania, the government should focus on diversifying exports, improving product quality, and enhancing competitiveness in global markets.

Also, this study informs on implementing export promotion policies, investing in infrastructure to reduce trade costs, and providing support for local industries to meet international standards can help boost exports and improve the country's trade balance. Additionally, fostering innovation and technology adoption in export-oriented sectors can further enhance the net barter of trade and drive industrialization. This goes together with establishing programs that support firms to upgrade their technologies, improve management practices, and access new markets. This could include providing business development services, facilitating access to finance, and promoting the formation of industrial clusters and value chains particularly for the small and medium firms. By enhancing the capabilities of domestic firms, Tanzania can increase their ability to compete with imports and participate in global trade.

The study acknowledges several limitations that should be considered when interpreting the findings. First, the use of secondary data from the Bank of Tanzania and National Bureau of Statistics restricts the generalizability of the results to Tanzania alone, as the country-specific nature of the data limits the ability to draw conclusions about the FDI-industrialization relationship in other developing countries with different economic and institutional contexts. Second, the narrow scope of variables included in the analysis, such as FDI, exchange rate, inflation, gross fixed capital formation, and net barter terms of trade, may overlook other important determinants of industrial growth, such as human capital development, technological innovation, institutional quality, and trade openness. Third, the lack of sectoral analysis in the study prevents the identification of heterogeneous effects across different industrial sectors, which may have varying absorptive capacities, linkages with the domestic economy, and technological requirements. Finally, the reliance on quantitative analysis alone may overlook important qualitative aspects of the FDI-industrialization relationship, such as investor perceptions, political stability, and regulatory environment. Future research should address these limitations by incorporating cross-country comparisons, a broader set of variables, advanced econometric techniques, sectoral analysis, and qualitative insights to provide a more comprehensive understanding of the FDI-industrialization nexus in Tanzania and other developing countries.

Authors' contributions

H.M.L.U and FAK drafted the manuscript. F.A.K performed the analysis and interpretation. All authors read and approved the manuscript.

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ORCID

Harold M. L. Utouh  <http://orcid.org/0000-0002-9355-4349>

Felician Andrew Kitole  <http://orcid.org/0000-0002-3596-5350>

Data availability statement

Data and material will be available upon reasonable request.

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