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Original Article

Input Factors and Industrial Sector Growth in Uganda (1986-2024)

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Input Factors, Industrial Sector Growth, Growth Fixed Capital Formulation, Foreign Direct Investment, Employment in Industry.

ABSTRACT

This study investigates the effects of input factors on the growth of Uganda's industrial sector. Specifically, it examines the impact of Gross Fixed Capital Formation (GFCF), investment in education, and population growth. A longitudinal research design was used to analyse changes over time, utilising secondary data from reputable national and international sources. The data was processed using STATA 14, which is effective for time series analysis. Findings show that increasing investment in GFCF, such as factories, machinery, and infrastructure, significantly boosts industrial growth, particularly in the short term through job creation and increased output. However, in the long run, the benefits diminish unless complemented by improvements in skilled labour and institutional support. In contrast, investment in education showed no direct effect on industrial growth, possibly due to a mismatch between education outputs and industrial job demands. Additionally, population growth alone was not found to drive industrial expansion, indicating that sheer numbers in the workforce do not guarantee increased productivity. The study recommends that the Government of Uganda continue prioritising investment in industrial infrastructure, especially in energy, transport, and manufacturing hubs. To improve education's relevance, greater emphasis should be placed on technical and vocational education and training (TVET), along with stronger industry-academic linkages and curriculum reforms. Furthermore, policymakers should promote labour-intensive industries like agro-processing, textiles, and construction, and support entrepreneurship and inclusive employment incentives, particularly targeting youth and women.

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INTRODUCTION

Industrialisation in Uganda is structured around various key sectors, with agriculture, manufacturing, extractive industries, energy, and services as its core. Agriculture remains the backbone, with industries focusing on the processing of food products, beverages, and textiles, such as coffee, tea, and sugar (Uganda Investment Authority, 2020). Manufacturing is expanding, particularly in construction materials like cement and steel, as well as light industries such as consumer goods and garments (Kiggundu, 2020). The extractive industries, including mining (especially gold) and oil, are emerging as significant contributors to the economy (World Bank, 2022). The energy sector, primarily hydroelectric power, is central to industrialisation, though energy access remains inconsistent, hindering growth (Uganda Electricity Regulatory Authority, 2021). Services such as construction, real estate, and financial services are growing in response to urbanisation and infrastructure demands (African Development Bank, 2021). Additionally, the ICT sector is becoming an important enabler of innovation and economic growth. Despite this progress, Uganda faces challenges in infrastructure, access to financing, and skills development, which slow the pace of industrial growth (Kiggundu, 2020).

In Uganda, Small- and medium-scale enterprises in the manufacturing industrial sector account for over 90 per cent of enterprises (Republic of Uganda 2010a; 2010b). According to the Uganda Bureau of Statistics (2023), there are 3,280 manufacturing establishments in Uganda. The study, which forms the main source of information and data for this analysis, focused on the formal sector, that is, businesses employing 5 persons and above. This means that the informal sector is not included. This is a major limitation as the informal sector is widespread and is believed to account for a large proportion of employment and output. The businesses covered in this registry were those engaged in the following activities: processing of meat, fish and dairy products; coffee processing; grain milling; tea processing; bakery and manufacture of other food products; manufacture of beverages and tobacco; manufacture of textiles and leather products; sawmilling, printing and publishing; chemicals and chemical products; manufacture of plastics; manufacture of metal products; manufacture of furniture; and other manufacturing.

Uganda's industrial sector, though contributing to around 20% of its GDP, still lags behind many other countries in sub-Saharan Africa (Uganda Bureau of Statistics [UBOS], 2021). According to the *World Bank* (2021), the manufacturing sector's contribution to Uganda's GDP has been stagnant at around 10% in recent years, far below the continental average of approximately 15-20%. This underdevelopment of the industrial sector remains a challenge for Uganda's aspirations to attain middle-income status by 2040, as outlined in the Uganda Vision 2040 (Republic of Uganda, 2013). Despite the country's wealth of natural resources such as oil, minerals, and fertile agricultural land, industrialisation has not been able to fully harness the potential of these resources.

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Table 1: Industrial Output in Uganda (Selected Sectors)

Sector	Industrial Output (USD)	Contribution to GDP (%)	Key Products
Agriculture and Agro-processing	1.7 billion	24%	Coffee, tea, sugar, maize, edible oils
Mining and Extractives	500 million	3.0%	Gold, cement, limestone, oil (exploration)
Manufacturing	1.3 billion	13.5%	Textiles, cement, food and beverages, construction materials
Energy (Hydroelectric)	550 million	4.5%	Electricity generation (mainly hydroelectric)
Construction	1.1 billion	8.8%	Building materials (cement, steel, etc.)
ICT and Digital Services	400 million	5.2%	Mobile communication, software, digital services
Financial Services	500 million	6.2%	Banking, insurance and microfinance services
Transport and Logistics	600 million	5.4%	Road, rail and air transport services
Tourism and Hospitality	750 million	7.5%	Hotels, resorts, safari services
Textiles and Apparel	320 million	2.4%	Garments, textiles, footwear

Source: *Uganda Bureau of Statistics (2023); World Bank (2022)*

Based on the table, we can assess which sectors are growing fast by considering both the industrial output (USD) and their contribution to GDP**.** Agriculture and Agro-processing, Manufacturing, construction, tourism and hospitality and ICT and Digital Services**.** This growth is attributed to increasing demand, infrastructure development, and broader global trends such as digitalisation and tourism growth.

The Ugandan government has earmarked industrialisation as a key strategy towards achieving economic diversification and reducing dependence on agriculture. The National Industrial Policy (2020) emphasises the need for value-added manufacturing, which would shift the economy away from the traditional reliance on raw agricultural exports. Several initiatives, such as the establishment of industrial parks and efforts to improve infrastructure, have been undertaken to promote industrial development. However, challenges persist, including inadequate infrastructure, limited access to finance, low technological adoption, and a shortage of skilled labour, all of which hinder the rapid industrial growth needed to propel Uganda into higher economic brackets.

Recent literature on industrialisation in Uganda highlights several key factors that impact its industrial growth trajectory. For instance, Amin and Haider (2021) argue that inadequate infrastructure and high energy costs remain primary obstacles to the expansion of Uganda's industrial base. In addition, the lack of financing options for small and medium-sized enterprises (SMEs) and the slow adoption of modern technology have further constrained the sector's potential (Klapper et al., 2020). The World Bank (2021) notes that Uganda's manufacturing sector remains undercapitalised, relying on outdated equipment and technologies, which reduces its global competitiveness.

The focus on growth, fixed capital formation**,** investment in education and population growth is interconnected and crucial for the sustainable development of Uganda's industrial sector. The government must adopt a holistic strategy that encourages investment in infrastructure, education, and technology while ensuring that industrial growth aligns with the growing population's needs and provides employment opportunities. By

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investing in these areas, Uganda can foster a vibrant, diversified industrial economy.

Problem Statement

The industrial sector in Uganda is critical for the country's economic transformation. It is a key driver of job creation, poverty reduction, and overall economic development (James, Eria & Ibrahim, 2023). The government has also established various industrial parks in strategic locations across Uganda, such as the Kampala Industrial Park**,** Namanve Industrial Park **(**Onyinyi & Asiimwe, 2024**).** The government also offers a range of tax incentives for investors in industrial sectors, such as tax holidays**,** duty exemptions**,** and tax rebates for businesses that contribute to Uganda's economic development (Rugasira et al., 2022).

Agricultural processing accounts for over 23% of the country's GDP. Yet, less than 10% of the country's agricultural produce is processed, leaving a vast opportunity for growth and industrialisation within this sector. The construction sector, on the other hand, has seen a steady increase in demand due to rapid urbanisation and population growth. According to the Uganda Bureau of Statistics (2024), the construction industry grew by 8.5% in 2020, but this growth is still insufficient to meet the growing infrastructure demands. Similarly, Uganda's infrastructure remains underdeveloped, with only 15% of the country's rural roads paved and a substantial gap in energy supply, with access to electricity standing at only 23% in rural areas.

Despite the efforts in the industrial sector, performance, the share of manufacturing (as a subset of industry) has experienced weaker growth, increasing from 5% to 8% of GDP and the growth of the manufacturing sector's contribution to GDP has slowed down in the past three decades. In 1990–1999, average annual growth was 13.2%, whereas in 2000–2009 it slowed down to 6.6% and in 2010–2018 it declined to 3.4% (Rumanzi et al., 2021). Interestingly, during the global financial crisis and the COVID-19 pandemic, the GFCF growth rate in Uganda reduced from 3.53% in 2018 to 2.09% in 2019, 1.97% in 2020, 1.92% in 2021, 1.87% in 2022, but later increased to 2.15% in 2023. Similarly, the export growth rate fell sharply from 43.95% in 2020 to -11.42% in 2021 (Behuria, 2021; Esaku, 2021). In contrast, imports were volatile during the financial crisis period, growing by -2.65% in 2020, 2.21% in 2021, 3.29% in 2022 and 5.42% in 2023, implying high dependency on different countries due to the slow pace of industrial sector growth (Buda & Ricz, 2023; James, Eria & Ibrahim, 2023).

It should be noted that there are limited studies on Uganda which have considered multiple growth theories to build the empirical model by including a variety of growth determinants. In some studies, authors have adopted the exploratory research design to study Uganda's growth determinants. In many of the studies on Uganda, the inherent challenge of endogeneity bias in growth models is not addressed, yet, many of these studies have not accounted for the role of productivity factors on Uganda's growth process. This study benchmarks the neoclassical growth model developed by Solow (1956) and builds on it to include the growth factors from the endogenous growth theory and uses the estimation methods that account for endogenous bias in order to further explore the effects of input factors on industrial sector growth in Uganda.

General Objective

To investigate the effect of input factors on industrial sector growth in Uganda.

Specific Objectives

- To determine the effect of growth fixed capital formulation (GFCF) on industrial sector growth in Uganda
- To determine the effect of investment in education on industrial sector growth in Uganda
- To determine the effect of population growth on industrial sector growth in Uganda

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Research Hypothesis

H0: There is no significant effect of growth fixed capital formulation (GFCF) on industrial sector growth in Uganda. H1: There is a significant effect of growth fixed capital formulation (GFCF) on industrial sector growth in Uganda.
H0: There is no significant effect of investment in education on industrial sector growth in Uganda. H1: There is a significant effect of investment in education on industrial sector growth in Uganda.
H0: There is no significant effect of population growth on industrial sector growth in Uganda. H1: There is a significant effect of population growth on industrial sector growth in Uganda.

METHODOLOGY

The study adopted a time series research design to analyse industrial sector growth in Uganda from 1986–2024, focusing on how Gross Fixed Capital Formation (GFCF), investment in education, and population growth influence industrial output. It relied entirely on secondary data from credible sources such as UBOS, World Bank, Bank of Uganda, IMF, UNESCO, and the Ministry of Finance, ensuring comprehensive datasets on capital investment, education, and demographic trends. Guided by the Solow-Swan Growth Model**,** which emphasises the roles of capital accumulation, labour, and technological progress, the study specified a linear regression model and further applied time series techniques, including ADF stationarity tests, ARIMA, VAR, ARDL, cointegration, and Granger causality, to capture both short- and long-term dynamics. Variables were carefully measured and processed through data cleaning, log transformation, and autocorrelation analysis before testing. Data analysis was conducted using STATA 14, while ethical considerations focused on confidentiality, authorised use of secondary data, accurate citation of sources, and transparency, thereby ensuring the study was rigorous, reliable, and policy-relevant.

Variable Stationarity

RESEARCH FINDINGS

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Variable	Level Test Statistic	Level p-value	1st Difference Test Statistic	1st Difference p-value	Order of Integration (I(d))
Industrial growth (Value added annual growth)	-1.542	0.5124	-3.922***	0.0019	I(1)
Gross Fixed Capital Formation	-1.992	0.6056	-4.926***	0.0000	I(1)
Education Expenditure (% of GDP)	-0.479	0.8961	-3.471**	0.0427	I(1)
Population (Labour Participation rate)	-0.957	0.6165	-2.864**	0.0496	I(1)

The stationarity test results indicate that all four variables, Industrial Growth, Gross Fixed Capital Formation, Education Expenditure, and Population Size (ages 15–64), are non-stationary at the level but become stationary after first differencing, meaning they are all integrated of order one, or I(1). At the level, the p-values for all variables exceed the 5% significance level, failing to reject the null hypothesis of a unit root. However, at first difference, all variables show statistically significant test statistics with p-values below 0.05, confirming stationarity after differencing. This finding justifies the use of time series techniques suited for I (1) variables, such as Vector Error Correction Models (VECM) models, which are appropriate when variables are non-stationary in levels but stationary in first differences.

Table 2: Checking Multicollinearity

Variable	VIF	SQRT VIF	Tolerance	R-Squared
Industrial growth (Value added annual growth)	1.71	1.31	0.5863	0.4137
Gross Fixed Capital Formation	3.17	1.78	0.3151	0.6849
Education Expenditure (% of GDP)	2.7	1.64	0.371	0.629
Population (Labour Participation rate)	1.69	1.3	0.5916	0.4084
Mean VIF	***2.32***			

The collinearity diagnostics indicate that multicollinearity is not a serious concern in the model. All variance inflation factor (VIF) values are below the commonly accepted threshold of 5, with the highest VIF being 3.17 for Gross Fixed Capital Formation. This suggests that no variable is

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excessively correlated with others in the regression. Tolerance values, which are the inverse of VIF, are all above 0.1, further supporting the absence of problematic multicollinearity. The mean VIF of 2.32 also reinforces this conclusion, indicating a generally low level of multicollinearity across the variables. Therefore, the regression estimates can be considered stable and reliable in terms of multicollinearity risk.

Table 3: Cointegration Test

Maximum Rank	Parameters	Log Likelihood (LL)	Eigen value	Trace Statistic	5% Critical Value
0	24	-44.3957	-	61.8716	54.64
1	31	-29.7464	0.58845	32.573*	34.55
2	36	-21.3039	0.40051	15.688	18.17
3	39	-16.3112	0.2611	5.7026	3.74
4	40	-13.4599	0.1587	-	-

The Johansen cointegration test results suggest the presence of one cointegrating relationship among the variables at the 5% significance level. At rank 0, the trace statistic is 61.8716, which exceeds the critical value of 54.64, leading us to reject the null hypothesis of no cointegration. However, at rank 1, the trace statistic is 32.573, which is just below the critical value of 34.55 and marked with an asterisk, indicating that it is marginally significant at the 5% level. Since we reject the null at rank 0 but fail to reject it at rank 1, the conclusion is that there is one cointegrating vector in the system. This implies that the variables share a single long-run equilibrium relationship, and a VECM with one cointegrating equation is appropriate for modelling their dynamics.

Vector Error Correction Model (VECM) Results

The Vector Error Correction Model (VECM) is used in this study to examine both short-term dynamics and long-term relationships among key variables affecting industrial sector growth in Uganda. Since variables like Gross Fixed Capital Formation, labour input, investment in education, and industrial output are likely non-stationary but cointegrated, VECM is suitable for capturing how deviations from the long-run equilibrium adjust over time while modelling short-run interactions. This approach, applied after conducting unit root and cointegration tests, allows for robust analysis of both immediate and sustained impacts of input factors on industrial growth from 1986 to 2024.

Table 4: Vector Error Correction Model (VECM) Results

Variable	Coef.	Std. Err.	z	P>|z|
Error Correction Term	***-0.89978******	***0.187132***	***-4.81***	***0.000***
	Short Run			
Industrial Growth	0.078732	0.167439	0.47	0.638
Gross Fixed Capital Formation	1.142021**	0.449658	2.54	0.011
Education Expenditure	-0.26815	0.547637	-0.49	0.624
Population (Labour force participation rate)	-0.07382**	0.030412	-2.43	0.015
Constant	0.068864	0.078724	0.87	0.382
	Long Run			
Gross Fixed Capital Formation	0.292523***	0.091365	3.2	0.001
Education Expenditure	-0.07782	0.327654	-0.24	0.812

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Population (Labour force participation rate)	-0.01856	0.021637	-0.86	0.391

Notes: Vector Error-Correction Model: Sample: 1992 – 2024, Number of observations: 33, Log likelihood = -30.40603, Det (Sigma_ml) = 0.0000742. RMES = .3634, R-Square = 0.5966.

Effect of Gross Fixed Capital Formation (GFCF) on Industrial Sector Growth in Uganda

In the short run, Gross Fixed Capital Formation (GFCF) has a statistically significant and positive effect on industrial growth in Uganda. The coefficient of 1.1420 (p = 0.011) suggests that a 1% increase in GFCF is associated with an approximate 1.14% increase in industrial output in the short term. This result implies that immediate investments in physical assets such as infrastructure, machinery, and buildings play a strong role in stimulating industrial activities, possibly by expanding production capacity and improving productivity.

In the long run, the effect of GFCF remains positive and statistically significant, though smaller in magnitude. The coefficient is 0.2925 (p = 0.001), indicating that sustained investment in capital formation contributes to long-term industrial sector growth, albeit at a more modest rate. This shift from a high short-run impact to a lower long-run effect suggests diminishing marginal returns over time or the need for complementary factors such as human capital or institutional strength to maintain growth momentum in the industrial sector.

Effect of Investment in Education on Industrial Sector Growth in Uganda

In the short run, investment in education does not have a statistically significant effect on industrial growth in Uganda. The coefficient is negative (-0.2682) and the p-value is high (0.624), indicating that increases in education spending do not translate immediately into increased industrial productivity or output. This may reflect a lag between education investment and the development of a skilled labour force capable of contributing effectively to industrial activities.

In the long run, the relationship remains statistically insignificant, with a coefficient of -0.0778 (p = 0.812). The continued lack of significance suggests that educational investments, as currently structured, may not be sufficiently aligned with the skill demands of Uganda's industrial sector. Alternatively, the impact of education may manifest more indirectly or over an even longer horizon than captured in this model. These results highlight the need to re-evaluate how education policies are tailored to support industrial development.

Effect of Population (Labour Force Participation Rate) on Industrial Sector Growth in Uganda

In the short run, the labour force participation rate (a proxy for population effect) has a statistically significant negative impact on industrial sector growth. The coefficient of -0.0738 (p = 0.015) indicates that a higher proportion of the population participating in the labour force may be associated with reduced industrial output in the short term. This could suggest labour market mismatches or underemployment, where increases in labour supply are not matched by productive industrial opportunities.

In the long run, the negative relationship persists but becomes statistically insignificant. The coefficient is -0.0186 (p = 0.391), indicating a weak and non-significant long-term impact. This result may reflect structural issues in labour quality or the industrial sector's limited capacity to absorb labour productively over time. It underscores the need for policies that not only increase labour participation but also enhance worker skills and industrial employment opportunities.

Error Correction Term

The error correction term (ECT) in the VECM output has a coefficient of -0.89978 and is highly statistically significant (p = 0.000), indicating a strong and stable long-run relationship among the variables. The negative sign confirms that

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deviations from the long-run equilibrium are corrected over time, with approximately 90% of the disequilibrium adjusted within one period (likely one year, depending on the dataset's frequency). This implies that the system quickly returns to its equilibrium path after a short-term shock, and the speed of adjustment is both economically meaningful and statistically robust. A high magnitude and significance of the ECT reinforce the presence of cointegration among industrial growth, capital formation, education, and population variables.

Table 5: Post Estimation Diagnostic Tests

Test	Test Statistic	P-Value	Decision (5%)
Breusch-Pagan Test (Heteroskedasticity)	chi2(1) = 0.20	0.6553	*Fail to Reject H0: No heteroskedasticity*
Shapiro-Wilk Test (Normality)	W = 0.95323	0.16523	*Fail to Reject H0: Residuals are normal*
Breusch-Godfrey LM Test (Autocorrelation)	chi2(2) = 2.387	0.3031	*Fail to Reject H0: No serial correlation*
Ramsey RESET Test (Model Specification)	F (3, 28) = 2.25	0.1044	*Fail to Reject H0: No omitted variables*

The diagnostic test results confirm that the VECM model is statistically sound and well-specified. The Breusch-Pagan test for heteroskedasticity yielded a p-value of 0.6553, indicating that we fail to reject the null hypothesis of constant variance. This suggests that the model's residuals are homoscedastic, a desirable property that ensures the efficiency of coefficient estimates. Similarly, the Shapiro-Wilk test for normality produced a p-value of 0.1652, well above the 5% threshold, confirming that the residuals are normally distributed. This is important for making valid statistical inferences, especially when relying on hypothesis testing.

Additionally, the Breusch-Godfrey LM test for autocorrelation showed a p-value of 0.3031, meaning we fail to reject the null hypothesis of no serial correlation in the residuals. This supports the reliability of standard errors and helps avoid misleading significance levels. Lastly, the Ramsey RESET test yielded a p-value of 0.1044, indicating no evidence of model misspecification or omitted variable bias. Together, these results suggest that the VECM model is robust, with well-behaved residuals and a correct functional form. Consequently, the short-run and long-run relationships estimated by the model can be interpreted with confidence.

DISCUSSION

Effect of Gross Fixed Capital Formation (GFCF) on Industrial Sector Growth in Uganda

The results of the study show that Gross Fixed Capital Formation (GFCF) significantly boosts industrial growth in both the short and long run, albeit with varying intensities. In the short run, the strong positive effect of GFCF suggests that increases in investment, such as in infrastructure, machinery, and industrial buildings, can rapidly stimulate industrial productivity. This aligns with the Solow Growth Model, which emphasises capital accumulation as a primary driver of output growth, especially in the early stages of economic development. In Uganda's context, the short-run responsiveness of industrial output to GFCF may

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reflect the country's need for foundational infrastructure to support industrial activity, such as energy access, transport networks, and manufacturing facilities.

In the long run, while the positive relationship between GFCF and industrial growth persists, its magnitude is lower. This reflects the Solow Model's prediction of diminishing marginal returns to capital, where sustained growth depends not only on accumulating capital but also on improvements in technology and human capital. In Uganda, as capital stock builds over time, further investments in capital alone yield diminishing returns unless complemented by institutional quality, skilled labour, and innovation. This shift highlights the need for a balanced growth strategy that pairs capital investment with other growth-enhancing factors to sustain long-term industrial expansion.

Empirical evidence supports these conclusions. A 2025 study by Nyiramahoro and Kijjambu finds that GFCF is positively and significantly related to GDP growth in Uganda, affirming its crucial role in macroeconomic performance (Nyiramahoro & Kijjambu, 2025). Another study by Wabiga & Nakijoba (2018) finds that while GFCF may have a negative short-run effect due to lag in absorption or misallocation, its long-run impact on growth is clearly positive (Wabiga & Nakijoba, 2018). These findings reinforce the view that capital investment remains a cornerstone of Uganda's industrial development strategy but must be accompanied by structural reforms to maximise its long-term benefits.

Effect of Investment in Education on Industrial Sector Growth in Uganda

The insignificance of education expenditure on industrial growth in both the short and long run challenges some theoretical expectations under the Solow growth model. In this model, human capital, often proxied by education investment, is seen as a critical driver of total factor productivity and sustained long-term economic growth. However, the negative and insignificant coefficients observed in this study suggest a misalignment between educational outcomes and the demands of Uganda's industrial sector. This could reflect issues such as skill mismatches, poor quality of education, or the overemphasis on theoretical over practical training. In Solow's framework, if education does not effectively enhance labour productivity, then it cannot significantly contribute to capital deepening or technological progress.

In the Ugandan context, these results highlight systemic inefficiencies in how educational resources are allocated and utilised. Despite increasing investment in education, the industrial sector might not be benefiting because the labour force emerging from educational institutions lacks the practical and technical skills required for industrial transformation. Moreover, structural constraints like limited absorption capacity in the industrial sector, weak linkages between education and industry, and underinvestment in vocational and STEM education reduce the effectiveness of educational expenditure. This disconnect underscores the need for policy realignment toward demand-driven curricula, enhanced technical education, and partnerships between educational institutions and industrial stakeholders.

Interestingly, some empirical studies contradict these findings by showing positive effects of education expenditure on broader economic growth. For example, Musila and Belassi (2005) found that education expenditure per worker had a significant positive impact on both short- and long-run economic output in Uganda (Musila & Belassi, 2005). Similarly, Okubal (2005) also documented a positive effect of education on human capital and GDP growth (Okubal, 2005). These divergent findings suggest that while education may benefit overall economic performance, its direct link to industrial growth requires targeted reforms, particularly in aligning education policy with industrial needs and fostering technical and vocational training systems. In sum, the current

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structure of educational investment in Uganda may need to be recalibrated to fully unlock its potential as a growth catalyst for the industrial sector.

Effect of Population (Labour Force Participation Rate) on Industrial Sector Growth in Uganda

The result, indicating a statistically significant short-run negative effect of labour force participation on industrial growth in Uganda, suggests a critical mismatch between labour supply and demand in the industrial sector. Theoretically, within the Solow Growth Model framework, labour is a vital input in the production function alongside capital and technology. However, if additional labour does not complement capital effectively due to either inadequate skills or poor industrial absorption capacity, the result may be diminishing returns or even productivity losses in the short term. The finding of a negative coefficient implies that Uganda's labour force, particularly as measured by the participation rate, may be growing faster than the ability of the industrial sector to productively engage it. This often results in underemployment, inefficiencies, and an overall drag on productivity in the short term.

In real-life terms, this short-run negative impact could reflect Uganda's labour market realities. A large segment of the workforce remains in low-skilled, informal employment, especially in rural and subsistence-based sectors, with limited transition into formal industrial jobs. Youth unemployment is high, and the education-to-employment pipeline remains weak. This dynamic is corroborated by Bbaale (2014), who found that Uganda's youth labour force, though increasingly educated, remains underemployed and concentrated in informal sectors with low productivity (Bbaale, 2014). Another study by Apire et al. (2023) also found that increased female labour force participation used as a broader proxy had a negative short-term impact on economic growth in Uganda, largely due to concentration in agriculture and informal sectors (Apire et al., 2023). These studies emphasise that mere increases in participation do not equate to productivity unless accompanied by effective sectoral integration.

Over the long run, the insignificance of the population variable suggests that the industrial sector does not benefit from demographic trends unless significant structural changes occur. This aligns with empirical findings indicating that Uganda's industrial sector has not grown sufficiently in job-creating capacity to absorb its expanding workforce. For example, Mukoki et al. (2023) note that even shocks in the industrial sector value added in Uganda show limited effects on unemployment, further highlighting the sector's weak employment linkage (Mukoki et al., 2023). In light of these findings, the long-term solution lies in improving the quality of labour, enhancing vocational training, and aligning education with industrial needs. Moreover, targeted industrial policies that stimulate labour-intensive manufacturing, such as agro-processing or textiles, could bridge the labour-absorption gap. This would allow Uganda to harness its demographic dividend rather than letting it become a structural burden.

CONCLUSIONS

This study shows that increasing investment in things like factories, machinery and infrastructure, which economists call Gross Fixed Capital Formation, can help Uganda's industrial sector grow. In the short term, spending on these areas has a big and immediate effect by creating jobs and boosting production. Over the long term, the impact continues, but the gains are smaller unless Uganda also improves other parts of the economy, like skilled labour and strong institutions. This means that while building things is important, it's not enough by itself to keep industries growing forever.

On the other hand, the money Uganda spends on education does not seem to help industrial growth directly, at least not in the short term or the long term. This could be because the type of education people are getting does not match the kinds of jobs available in industries. Many people may leave

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school without the hands-on skills needed in factories or technical workplaces. So even though education is important, Uganda needs to make sure students are learning practical skills that industries actually need, like in engineering, manufacturing, and technology.

Lastly, the study finds that just having more people in the workforce doesn't automatically lead to more industrial growth. In fact, in the short term, it can slow things down, probably because there aren't enough quality jobs for everyone, or because people lack the skills for available jobs. In the long run, the effect of the growing workforce evens out, but doesn't become helpful unless the industrial sector is ready to use that labour productively. So, for Uganda to truly benefit from its large and young population, it must create more jobs in industries and make sure people are trained to fill them.

STUDY RECOMMENDATIONS

The government of Uganda should continue prioritising investments in Gross Fixed Capital Formation, particularly in industrial infrastructure such as energy, transport networks, and manufacturing hubs. These investments have shown strong positive effects on industrial growth in both the short and long run. However, to maintain their impact, they must be accompanied by policies that improve efficiency in capital use and reduce delays in project implementation. Public-private partnerships (PPPs) can also play a critical role in mobilising resources and accelerating infrastructure development.

Second, education policy needs to be reoriented to better support industrial development. The current structure of education spending appears disconnected from the skills required in the industrial sector. The government and education stakeholders should prioritise technical and vocational education and training (TVET), strengthen linkages between universities and industries, and reform curricula to emphasise job-relevant skills. Doing so will ensure that education investments translate into a more productive labour force that meets the evolving needs of Uganda's industrial economy.

Uganda must adopt active labour market policies that address underemployment and the mismatch between labour supply and demand. Policymakers should focus on creating labour-intensive industrial sectors, such as agro-processing, textiles, and construction, which have the potential to absorb large numbers of workers. Strengthening entrepreneurship programs and offering incentives to industries that employ youth and women could also improve labour force utilisation. In the long run, these measures will help Uganda harness its demographic dividend and reduce unemployment while supporting inclusive industrial growth.

REFERENCES

African Development Bank. (2021). Uganda: Infrastructure and Industrialization in Focus.

African Development Bank. (2021). *Uganda: Infrastructure and Industrialization in Focus*. www.afdb.org

Agrawal, G. (2015). Foreign Direct Investment and Economic Growth in BRICS economies: A Panel Data Analysis. Journal of Economics Business and Management, 3, 421-424. https://doi.org/10.7763/JOEBM.2015.V3.221.

Almeida, A., Garcia, C., & Silva, R. (2020). *Vocational Education and Industrial Sector Development: A Global Review of TVET Programs and Their Impact on Manufacturing Growth*. Education Economics, 28(2), 111-130.

Behuria, P. (2021). The political economy of reviving industrial policy in Uganda. *Oxford Development Studies*, *49*(4), 368-385.

Buda, G., & Ricz, J. (2023). Industrial symbiosis and industrial policy for sustainable development in Uganda. *Review of Evolutionary Political Economy*, *4*(1), 165-189.

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Article DOI: https://doi.org/10.37284/eajbe.8.2.3570

Calabrese, L., Golooba-Mutebi, F., & Mendez-Parra, M. (2019). Industrial development in Uganda: an assessment of the policy framework. *London: ODI*.

Canning, D., & Pedroni, P. (2020). *Human Capital and Productivity Growth: Education and Technology in Industrial Sectors*. Journal of Development Economics, 143, 47-61.

Diao, X., McMillan, M., & Rodrik, D. (2019). *The recent growth boom in developing economies: A structural-change perspective* (pp. 281-334). Springer International Publishing.

Dinh, H., & Vincent, K. (2023). Capital formation and industrial development in Africa: An empirical assessment. *African Journal of Economic Policy, 30*(1), 45–63.

Esaku, S. (2021). The short-and long-run relationship between trade openness and economic growth in Uganda. *Cogent Economics & Finance*, *9*(1), 1999060.

Gelb, A., Ramachandran, V., Meyer, C. J., Wadhwa, D., & Navis, K. (2020). Can Sub-Saharan Africa be a manufacturing destination? Labour costs, price levels, and the role of industrial policy. *Journal of Industry, Competition and Trade*, *20*, 335-357.

Gonzalez, M., & Rios, A. (2021). "Education investment for social equity and inclusion," *International Journal of Educational Development*.

Hagger, M. S., & Hamilton, K. (2024). Longitudinal tests of the theory of planned behaviour: a meta-analysis. *European Review of Social Psychology*, *35*(1), 198-254.

Hunziker, S., & Blankenagel, M. (2024). Longitudinal Research Design. In *Research Design in Business and Management: A Practical Guide for Students and Researchers* (pp. 201-220). Wiesbaden: Springer Fachmedien Wiesbaden.

James, M., Eria, H., & Ibrahim, M. (2023). Sectoral Growth Patterns and Unemployment in Uganda. *East African Journal of Business and Economics*, *6*(1), 59-78.

Kiggundu, M. (2020). *Industrialization in Uganda: Opportunities and Challenges*. Kampala: Makerere University Press.

Kiggundu, M. (2020). *Industrialization in Uganda: Opportunities and Challenges*. Kampala: Makerere University Press.

Kipyego, K., & Ndirangu, L. (2021). The impact of gross fixed capital formation on industrial growth in East Africa. *Journal of Development and Economic Studies, 9*(2), 112–127.

Kumar, S., & Patel, N. (2020). "Role of government policies in fixed capital formation," *Public Economics Quarterly*.

Lee, J., & Park, K. (2022). "Investment in education and its impact on economic growth," *Education Economics Journal*, 2022).

Matsuda, H., & Watanabe, A. (2024). A comparative study of population management approaches in infectious disease control, population management of fisheries and wildlife, and integrated pest management in agriculture. *Population ecology*.

Mbonyinshuti, E., & Lwiza, N. (2020). *Education and Industrialization in Sub-Saharan Africa: A Focus on Skills Development for Growth*. African Development Review, 32(4), 567-589.

Nguyen, L., & Tran, T. (2020). *Investment in STEM Education and its Impact on Industrialization in Emerging Economies*. International Journal of Industrial Economics, 62(4), 123-138.

Odhiambo, N. M. (2020). Gross fixed capital formation and industrial output in Sub-Saharan Africa: A causality analysis. *African Development Review, 32*(3), 278–290.

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Article DOI: https://doi.org/10.37284/eajbe.8.2.3570

OECD. (2020). *Education and Innovation for Industrial Growth: Global Trends and Policy Insights*. OECD Publishing.

Okafor, I.G., Ugochukwu, U.S. and Chijindu, E.H. (2016) Foreign Capital Inflows and Nigerian Economic Growth Nexus: A Toda Yamamoto Approach. European Journal of Accounting, Auditing and Finance Research, 4, 16-26

Onyinyi, B., & Asiimwe, N. (2024). Key drivers of investment initiatives in Uganda's pharmaceutical industry. *Social Science & Medicine*, *344*, 116558.

Osuji, E. (2015). Foreign Direct Investment and Economic Growth in Nigeria: Evidence from Bounds Testing and ARDL Models. Journal of Economics and Sustainable Development, 6, 205-211.

Pradhan, R. P., Arvin, M. B., & Hall, J. H. (2021). Capital formation and industrial development in BRICS: A panel data approach. *Economic Change and Restructuring, 54*(1), 23–42.

Pulstova, M. (2016). Effects of Foreign Direct Investment and Firm Export in Economic Growth: Evidence from Uzbekistan. European Journal of Business and Management, 8, 45-59.

Rahman, S. (2023. "Diversification strategies for industrial sector growth in emerging economies." *Journal of Economic Development*.

Rodrik, D., Diao, X., McMillan, M., & Ellis, M. (2022). Africa's Manufacturing Puzzle: Evidence from Tanzanian and Ethiopian Firms.

Rugasira, J., Moses, A., Byarugaba Mbiito, J., Makumbi, R., Kyotuheire, J., & Asiimwe, J. (2022). Green Manufacturing and Environmental Sustainability in Selected Manufacturing Entities in Kampala District, Uganda.

Rumanzi, P. I., Turyareeba, D., Kaberuka, W., Mbabazize, R. N., & Ainomugisha, P. (2021). Uganda's growth determinants: a test of the relevance of the neoclassical growth theory. *Modern Economy*, *12*(1), 107-139.

Sansom, B. (2024). Traditional economic systems. In *The Bantu-speaking peoples of southern Africa* (pp. 135-176). Routledge.

Sharma, R., & Patel, M. (2021). "Industrial sector growth and employment: The global nexus." *International Journal of Employment Studies*.

Solow, RM (1956). A contribution to the theory of economic growth. The Quarterly Journal of Economics, 70(1), 65–94.

Srinivasan, K., & Gupta, R. (2023). "The role of fixed capital formation in economic growth and development," *Economic Growth and Development Studies*.

Uganda Bureau of Statistics. (2023). *Uganda Economic Report*. www.ubos.org

Uganda Central Bank. (2021). *Uganda Financial Sector Overview*. www.bou.or.ug

Uganda Development Forum (2015). *The Political Economy of Uganda's Political Stability*. Uganda National Planning Authority.

Uganda Electricity Regulatory Authority. (2021). *Energy Access and Infrastructure Development in Uganda*. www.era.or.ug

Uganda Electricity Regulatory Authority. (2021). *Energy Access and Infrastructure Development in Uganda*.

Uganda Investment Authority. (2020). *Uganda Industrial Sector Report*.

Uganda Investment Authority. (2023). *Industrial Sector Report*. www.ugandainvest.go.ug

Uganda Tourism Board. (2023). *Tourism and Hospitality in Uganda*. www.ugandatourism.org

 This work is licensed under a Creative Commons Attribution 4.0 International License.

Article DOI: https://doi.org/10.37284/eajbe.8.2.3570

Ullah, S., & Khan, A. (2022). Gross fixed capital formation and industrial growth: Evidence from South Asia. *Asian Economic and Financial Review, 12*(4), 307–321.

Umaru, A., Gambo, E. and Pate, H.A. (2015). Foreign Direct Investment and the Growth of the Nigerian Economy. Journal of Economics and Development Studies. 3, 193-211. https://doi.org/10.15640/jeds.v3n1a10

UNESCO. (2020). *Inclusive Education and Industrial Growth: Linking Educational Access to Sustainable Industrial Development*. UNESCO Publishing.

Uwubanmwen, A.E. and Ogiemudia, O.A. (2016). Foreign Direct Investment and Economic Growth: Evidence from Nigeria. International Journal of Business and Social Sciences, 7, 43-57.

World Bank. (2022). *Uganda Economic Update: Industrialization and Economic Growth*. www.worldbank.org.

World Bank. (2022). *Uganda Economic Update: Industrialization and Economic Growth*.

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