



IMPLICATION OF 4TH INDUSTRIAL REVOLUTION ON TAX REVENUE COLLECTION IN TANZANIA: A CASE OF MANUFACTURING INDUSTRIES.

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ABSTRACT: *The study assessed the implication of the Fourth Industrial Revolution (4IR) on tax revenue collection in Tanzania. Specifically, the study set out to establish the causality of investment in 4IR technologies, on manufacturing industries' Value Added Tax (VAT); determine the influence of investment in 4IR technologies on manufacturing industries' Corporate Tax and examine the effects of investment in 4IR technologies on manufacturing industries' Employment Tax (PAYE). To achieve the research objectives, the study used a quantitative descriptive design to generate the required data. Moreover, the study used structured questionnaires for cross-sectional survey, administered with 225 production managers of manufacturing industries in Tanzania. It used probability sampling in the form of cluster sampling. Additionally, the study used the Least Square method to analyse the objectives of the study in addition to testing the hypotheses. The study found a positive and statistically significant causal effect between investment in modern technology, VAT, Corporate tax and Employment Tax (PAYE) of manufacturing firms in Tanzania, for the period under study. Implicitly, the emergence of 4IR does not necessarily occasion a decline in tax revenue collections (VAT, PAYE, and Corporate Tax) on the part of manufacturing firms in developing countries endowed with resources, like Tanzania, but rather complements and accelerates its growth. Thus, the study calls on the Tanzania Government to review and improve its Sustainable Industrial Development Policy of 2020 and the Integrated Industrial Development Strategy of 2025 to embrace, promote and support not only resource-based industries, but also technological based industries, to speed up industrialization within the country and ultimately improve and increase tax revenue collection. The government should also improve its investment policies and align them with technological changes brought by 4IR, to attract more foreign direct investments, importation and adaptation of 4IR technologies from developed countries that enhance productivity, turnover and tax revenue collections from the manufacturing sector.*

KEYWORDS: 4th Industrial Revolution, Tax revenue.



INTRODUCTION AND BACKGROUND

Tanzania has been emphasising industrialization since independence. From 1961 to 1967 the country was under mixed economy which was led by private sector. The ownership of most industries in Tanzania was under colonial power. Most of those industries focused on the production of consumer goods and processing industries which set for raw materials preparation to satisfy the needs of European industries (Wangwe et al 2014). The industrial sector in Tanzania has passed through many phases since independence to date. Industrialization and deindustrialization phases were witnessed during that period, which necessitate the government to initiate the structural adjustment programmes as well as conduct policy reforms to ensure development of the sector. Despite all efforts manufacturing industries remain vulnerable to growth problems and poorly contribute to tax revenue collections by the government (Msami and Wangwe 2016).

The new era of manufacturing industry in Tanzania is manifested the formulation and implementation of the Sustainable Industrial Development Policy 2020 (SIDP), with an intention of boosting the industrial sector towards attainment of sustainable economic growth, through increase in tax revenue collections, job creation, human development, economic transformation and equitable development (Ministry of industry and trade, 1996). Implementation of SIDP was in three phases, phase I (1996-2000), this phase aimed at consolidating and rehabilitating industries through restructuring and capital financing. Phase II (2000-2010), this phase aimed at owning newly established machinery industries, promote export manufacturing, acquisition of emerging technological innovation to exploit the country's natural resources and establishment of light capital goods and intermediate goods. Phase III (2010-2020) aimed to consolidate industries that were established during phase I and II and provide major investment in basic capital goods (Msami and Wngwe 2016)

From the Sustainable Industrial Development Policy of 2020, Tanzania formulated the Integrated Industrial Development Policy (IIDS) of 2025. Its main objective was to deliver double digit, broad based economic growth within the second decade of the 21st century. The strategy focused on agricultural transformation to raise productivity to global levels and initiate a dynamic process of agricultural-led and resource-based industrialization. The strategy was to develop integrated agricultural production systems which include modern and commercialized agricultural production, backward linkages to production and supply of inputs and forward linkages to agro-processing, packaging and marketing. Through this strategy, domestic smallholder producers linked with large international firms through contract farming procedures which ensure access to state of the art production technologies, integration of domestic markets and linkages to international markets.

The IIDS of 2025 responds to the need for a dynamic strategy aimed at guiding the process of resource-based industrialization. This strategy reflects difficulties that Sub-Saharan African struggle with in attracting and retaining labour intensive industries as a growth strategy, considering higher labour costs and lower skill levels than those prevailing in competing Asian Economies. Measures recommended to change this situation include undertaking initiatives for extending the outreach and raising the quality of social services in the education and health sector, investment aimed at facilitating the delivery of cost effective and reliable infrastructural services in transportation, power, energy sectors with a view of creating a conducive investment climate. Yet, all this did not bear fruit as planned, since governments have failed to properly prepare and invest in infrastructure to withstand, sustain and harvest benefits of the



technological revolution. Particularly, the emergence of the Fourth Industrial Revolution technologies has made it cheaper to produce with modern technologies rather than depending on cheap labour and resources (Lee 2019).

Industries in developing countries such as Tanzania are labour-intensive, with little recourse for the utilisation of technology. Most significantly, due to the unpreparedness to embrace technological advancement, the emergence of 4IR in developing countries tends to reverse the growth catch-up theory as promulgated by Lee et al. (2019). Production costs increasingly drop with technology than resources endowment or using of cheap labour. Second, the deepening of human and physical capital tends to raise tax revenue collections and GDP per capita in the short-run, but the law of diminishing returns suggests that as an economy continues to increase its human and physical capital, with the marginal gains to economic growth diminishing in the long-run, with the exception of where technological advancement comes into the picture.

Industrial development has been an important part of Tanzania's development strategies after independence. Policy makers must lead the process of transforming the country's economy from low productivity and low growth to high productivity and dynamic economy associated with structural change and sustained growth in tax revenue (Wangwe et al 2014). However, the share of the manufacturing sector relative to the GDP and its' growth rate has remained relatively stagnant over past decades. For policy purpose and to draw relevant lessons, this study aimed to examine the causal effect and relationship between industrial investment in modern technologies (particularly the 4th industrial revolution technologies) and tax revenue collection (Value Added Tax, Employment Tax and Corporate Tax) by the government. According to national tax statistics from TRA in 2022, the proportion of these types of taxes contributes more than 75 percent of all the tax revenue collected by the government from manufacturing industries in Tanzania.

Scholars of 4IR, such as Lee (2019), Schwab (2016) and Salam (2018) focused on developed and advanced economies and how they could develop and acquire skill sets targeting and matching the requirements of the new technology and how they would accommodate structural adjustment challenges as workers lose their jobs and businesses fail to remain competitive, with none of them paying any attention to the possible effects of the 4IR on less developed economies such as Tanzania. This study has bridged this gap. A few scholars such as Ayentimi and Burgess (2019), Adenle (2018) have discussed the relevance of 4IR in Sub-Saharan Africa and Africa in general. However, none of them have critically analysed the ultimate effects of 4IR on country's' tax revenue generation from the manufacturing sector, which this study has strived to cover.

The emergence of the Fourth Industrial Revolution (4IR) technologies has triggered a shift of manufacturing industries from poor countries like Tanzania, to rich countries with cheap technology (Schwabs, 2016). The Tanzania Industrial Integrated Development Strategy, which is based on low-cost labour, becomes irrelevant as innovation cuts down the cost of automation, with smart productivity boosting production. Thus, an outward shift of manufacturing industries from Tanzania to developed countries due to 4IR can cause massive decline in Corporate Tax, Value Added Tax and Employment Tax from manufacturing firms. This argument has found ready support in previous scholars (Lee et al 2019, Schwabs 2016, Ayentimi and Burgess 2019).



Regardless of the emergence of 4IR, the tax statistics of manufacturing firms gathered from Tanzania Revenue Authority for the period under study (2012-2021), portray a different trend from what has been expected. Corporate Tax has increased from TZS1.09 trillion in 2011 to TZS5.1 trillion in 2021. Employment Tax (PAYE) has increased from TZS727 billion in 2011 to TZS2 trillion in 2021. Value Added Tax has increased from TZS2.5 trillion in 2011 to TZS5.8 trillion in 2021. This abnormal trend calls for an investigation aimed at comprehending the effects of 4IR on tax revenue collection (Corporate Tax, PAYE, VAT) in the Tanzania manufacturing sector.

Recent studies on the digital and technological revolution in Tanzania and outside Tanzania (i.e., Newman et al. (2016), Kweka (2018), Diyamett & Makundi (2012), Maskaeva et al. (2018), have emphasised how technological advancement has affected the performance of manufacturing industries and impaired the ability of revenue collecting authorities to collect tax revenues from digital businesses. This study focused on the emergence of 4IR technologies and their effects on the amount of tax revenue collected (Corporate Tax, Value Added Tax and Employment Tax) from manufacturing firms in Tanzania.

RESEARCH METHODOLOGY

Research Philosophy

This study adopted quantitative paradigm as a way of looking at the social reality or the world that is composed of certain philosophical assumptions that guide and direct thinking and actions as pointed out by Mertens (1998). A research approach is usually influenced by ontological and epistemological assumptions or stances of the researcher. This study has embraced the positivism ideology. The approach adopted in this study (positivism) aims to utilize hypotheses to test existing theories for generalization purposes in different settings.

Research Design

This study used quantitative descriptive design. Specifically, it deployed quantitative and statistical aspects of data organization, presentation and analysis through figures, numbers and tables. Deductive reasoning was employed by current study whereby the researcher formulated hypotheses, collected data during investigation of the problem and the subjected the data from investigation to analysis before drawing inferences and logical conclusions. Moreover, the study proved the hypotheses true or false. A survey strategy was opted for the above design.

Area of the Study

The study was carried out in Tanzania. In all, 61,110 manufacturing industries were involved in the study. The number represents the sum of manufacturing industries in Tanzania by June 2020. A sample size was then drawn from such a population, since it was unrealistic to reach every manufacturer.

Data Collection Methods

The study employed different data collection methods. Both primary and secondary data were collected. Structured questionnaires for the survey were administered with production managers of manufacturing industries to collect primary data. The study also used secondary



data to complement primary data. The main sources were documentary review of various official documents and reports (i.e., manufacturing industries' survey reports from the National Bureau of Statistics [NBS], the Tanzania Investment Reports from the Tanzania Investment Centre (TIC), relevant to the research problem.

Population and Sampling

The targeted population was all manufacturing industries in the country by June 2020. The targeted sampling unit were production managers or chief plant engineers of manufacturing industries. Since the study population was known with reliability and sampling frame easily determinable, the study adopted a probabilistic sampling method. Specifically, the study used the cluster sampling technique. A sample of 225 manufacturing industries was used in the current study to generate the required data. This study allowed the variability results of 5% (margin error), at 90% confidence interval at all times, using the Cochran Formula for sample calculation (Cochran, 1977).

Pre-Testing of Questionnaire

Pre-testing was conducted in circumstances that were similar to the actual data collection and on population members in the likeness of those sampled. Pre-testing of questionnaires using a total of 26 production managers of manufacturing industries, which was almost 10% of the total sample size, preceded the actual manufacturing industries survey. Sudman (1983) suggested the use of 20-50 cases during pre-tests as sufficient for discovering major errors in a questionnaire and ensure data validity.

DATA ANALYSIS

2.7.1 Descriptive Statistics

Primary data was analysed quantitatively. Measures of central tendencies, skewness and kurtosis of data covering the study period (2012 to 2021), were conducted using descriptive statistics.

Estimation Approach

The Least Square method was used to analyse the research objectives of the study, in addition to testing the associated hypotheses. The model helped to estimate changes in dependent variables (VAT, Corporate Tax and PAYE) amidst an independent variable change (Investment in 4IR technologies). Regression analysis describes the relationship between variables by fitting a line to the data observed. Prior to regression analysis, stationarity of time series properties was tested using Augmented Dickey Fuller (ADF), to understand the behaviour and patterns of the data.

To establish the effects of 4IR on tax revenue collection, the following estimation model was used:

$$Y_t = \beta_0 + \beta_1 X_t + e_t \dots\dots\dots 1$$

Where;



Y_t Stands for the outcome variables (VAT, Corporate Tax and Employment Tax) and X_t stands for investment in 4IR technologies. β_0 is the constant term and β_1 is the coefficient relating the explanatory variable of interest, and e_t stands for error term.

Description of Variables

Dependent Variables (Y)

Value Added Tax

It has been measured as the actual Value Added Tax collected from manufacturing industries in Tanzania during the period under review. The aggregate value of this variable represents tax charged at each stage of the manufacturing process where value is added.

Corporate Tax

In this study, Corporate Tax represents the amount of tax collected from manufacturing firms after accounting for all the costs associated with the manufacturing process, and the depreciation of capital assets. Corporate Tax captured in this study has been charged at 30 percent, as directed in the Income Tax Act.

Pay as You Earn

This refers to an employment tax collected from full time employees in the Tanzania manufacturing sector, for the period under review.

Independent Variable (X)

Investment in Modern Technology

This variable captures an investment made/spending by manufacturing firms in Tanzania for all the components of the 4th Industrial Revolution (artificial intelligence, nanotechnology, genetic engineering, bio-technology, 3-D printing, internet of things and cloud computing), with regard to the modernisation of manufacturing techniques.

PRESENTATION OF FINDINGS AND DISCUSSION

Introduction

This section presents empirical findings and their interpretations. Before analysing the degree of causality between investments in modern technology together with their effects on tax, it is important to, first, report the specifics of the estimate findings and test statistics. All the descriptive statistics were done using STATA 14.



Descriptive Statistics

This section presents summary data regarding the study's variables of interest, that is, the mean, standard deviation, minimum and maximum values, as well as the normality of all the variables the study has utilised. Summary statistics provide a quick overview of how the variables of interest behave.

Table 1: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
Ininvestment	10	26.9537	0.01948	26.9252	26.9746	-.2417558	1.572224
Inct	10	28.4276	0.36946	27.9038	29.2602	1.042797	3.826202
Inpaye	10	27.9984	0.35664	27.4947	28.3825	-.3325885	1.517996
Invat	10	29.1991	0.1844	28.8678	29.5012	-.3138891	2.664341
Intotaltax	10	29.7753	0.24523	29.3593	30.185	.097684	2.436422

Source: Author (2024)

Statistics from Table 1 show that, the average capital invested in modern technology for the period under review was TZS 26.9537 billion, and it ranged from TZS 26.9252 billion with a maximum of TZS 26.9746 billion. The maximum Corporate Tax collected from the manufacturing firms after their investment in modern technology had an average of TZS 28.4276 billion, with a minimum of TZS 27.9038 billion and a maximum of TZS 29.2602 billion. Pay-As-You-Earn (PAYE) ranged from a minimum of TZS 27.4947 billion to a maximum of TZS 28.3825 billion, with an average of TZS 27.9984 billion. Value Added Tax collected from the manufacturing firms after their investment in modern technology ranged from a minimum of TZS 28.8678 billion to a maximum of TZS 29.5012 billion. However, the total tax collection from the manufacturing firms during the same period under review ranged from a minimum of TZS 29.3593 billion and a maximum of TZS 30.185 billion, with an average of TZS 29.7753 billion.

The study also used mean-based coefficient of Skewness and Kurtosis to test the normality of the study variables. Skewness measures symmetry of probability distribution of a variable about its mean, and its normality. Skewness results show that Corporate Tax (CT), and total tax collection from the manufacturing firms, are positive and normally distributed, whereas PAYE, VAT and investment in modern technology are negative, but also normally distributed. In relation to Kurtosis, all the variables in the model are seen to be positive and normally distributed.

Correlation Analysis

The purpose of correlation analysis is to illustrate the magnitude and direction of the link between investment in modern technology and Corporate Tax, Pay-As-You-Earn and Value Added Tax. The correlation between these variables is as summarised in Table 2:

**Table 2: Summary of variables' correlation**

Variable	Investment	Corporate Tax	PAYE	VAT	Total
Investment	1				
Corporate Tax	0.6308	1			
PAYE	0.9733	0.5792	1		
VAT	0.882	0.6581	0.8399	1	
Total	0.8877	0.8878	0.8517	0.9178	1

Source: *Author (2024)*

Results from Table 2 show that Corporate Tax, PAYE, Value Added Tax and total tax collection from the manufacturing firms, positively correlate with the independent variable, investment in modern technology done by the manufacturing firms in Tanzania. These study findings differ from those of previous studies by Naudé et al. (2017), who had found that many occupations and jobs had already been significantly transformed because of the intensification of the current technological revolution, with some jobs and occupations growing rapidly and undergoing changes in capabilities and skill sets requirements, whereas other occupations and jobs became threatened by redundancies, massive job dislocations and skills disruption. Current study findings indicate a strong positive correlation between investment in modern technologies and Employment Tax (PAYE). Implicitly, regardless of technological developments in most manufacturing industries, these firms are not fully-fledged capital intensive: They are still employing people and engaging human capital in their productive activities.

Lee et al. (2019) also pointed out that, as a result of the Fourth Industrial Revolution, production becomes cheaper with technology rather than with cheap labour and resources. This study's finding also reveal a different perspective from previous scholars, whereby manufacturing industries kept on employing people even after investing heavily in modern technologies. Besides, Schwab (2016), suggested that the emergence of the Fourth Industrial Revolution in Sub-Saharan Africa caused an investment shift from poor countries to rich countries. Their findings suggest a decline in both Corporate Tax and VAT from manufacturing industries, because of a drastic drop in investment. This study's findings indicate different facts. For example, despite manufacturing industries investing in modern technologies, both Corporate Tax and VAT kept on increasing at an incremental rate. Even though there might be other factors, investment in modern technology did not substantively entice a migration of investment to rich countries.

Time Series Properties

Results from the stationarity test obtained using the Augmented Dickey Fuller (ADF) Test presented in Table 3, show that investment in modern technology, VAT and Corporate Tax are stationary at order one, whereas PAYE is stationary after second differencing:

Table 3: Augmented Dickey Fuller test results

Variable	Level	First difference	Second difference
In Investment	-1.081	-3.09**	
In VAT	-1.804	-4.092***	



In Corporate Tax	-0.021	-2.932**	
In PAYE	-1.284	-1.445	-3.494***

Where;

** indicate significant at 5% level

*** indicate significant at 1% level

Regression Results

Table 4: Pay-As-You-Earn (PAYE) as a Dependent Variable

					Number of obs = 10		
					F(1, 8) = 600.84		
					Prob > F = 0		
					R-squared = 0.947		
					Root MSE = 0.08705		
Inpaye	Coef.	Robust Std. Err.	t	P>t	[95% Conf. interval		
In investment in technology	17.81658	0.726847	24.51	0	16.14047	19.4927	
_cons	-452.224	19.60046	-23.07	0	-497.423	-407.025	

Source: Author (2024)

As Table 4 illustrates, investment in technology is statistically significant in influencing Employment Tax (PAYE) collections in Tanzania. Specifically, a percentage increase of investment in 4IR technologies by manufacturing firms in Tanzania, resulted in a 17.8 percent increase in collections of PAYE. Implicitly, manufacturing industries' investments in the Fourth Industrial Revolution technologies in Tanzania led to an increase in employment and related benefits and, ultimately, revenue collections from Employment Tax rather than cause mass unemployment and a tax revenue decline.

However, these findings are quite contrary to what has been proposed by 4IR scholars, such as Naude (2017), Lee et al. (2019), and Schwabs (2016). These scholars proclaimed that robotics and automation would cause multinational enterprises from developed economies to re-shore manufacturing and assembling operations to high-skilled developed regions, because of the disadvantage of low-wage labour found in developing countries in Africa, and lead to a massive decline in productivity and mass unemployment. Since all taxes collected by governments from manufacturing industries, including PAYE, were expected to decline, the current study suggests that manufacturing industries in Tanzania are not re-shoring to developed countries; instead, there is still a demand for more workers, even with the emergence of 4IR. Impliedly, technology has been unable to replace cheap resources in Tanzania. As such, the Tanzania Government should improve investment policies and attract more investors in the manufacturing sector. Such a move would invariably increase investment, employment and revenue collection from Employment Tax.

**Table 5: Corporate Tax as a Dependent Variable**

				Number of obs = 10		
				F(1, 8) = 6.23		
				Prob > F = 0.0372		
				R-squared = 0.4989		
				Root MSE = 0.2774		
Inct	Coef.	Robust Std. Err.	t	P>t	[95% Conf.	Interval]
In investment in technology	13.39595	5.368254	2.5	0.037	1.016736	25.77517
_cons	-332.642	144.653	-2.3	0.051	-666.213	0.928122

Source: Author (2024)

As data in Table 5 illustrates, investment in technology is statistically significant in influencing Corporate Tax Collections in Tanzania. Specifically, a percentage increase of investment in 4IR technologies by manufacturing firms in Tanzania resulted in a 13.4 percent rise in collections of corporate taxes. Impliedly, despite tremendous growth in technology, investments in manufacturing are increasing in Tanzania rather than declining and, therefore, the Corporate Tax revenue collected from manufacturing firms increases with the growth in technology. As such, the Tanzania Government should set up and improve policies that would allow growth of technical education as well as adaptation and imitation of modern technology and more investment in research and development. Such a move would expedite the technological growth within the country, growth in manufacturing investments and Corporate Tax revenue collections from manufacturing firms.

However, these findings do not support the prepositions made by Bangens (2014), Kweka and Salam (2018), to the effect that deficient performance of the manufacturing sector in Tanzania resulted from the country's failure to keep up with the pace of technological growth. Current study findings evidenced exemplary performance of the manufacturing sector in Tanzania, in terms of profitability, which resulted in an increment in Corporate Tax going into government coffers. All these incremental gains have been driven by the growth of investment in 4IR technologies.

**Table 6: VAT as a Dependent Variable**

				Number of obs = 10		
				F(1, 8) = 29.52		
				Prob > F = 0.0006		
				R-squared = 0.8032		
				Root MSE = 0.08676		
Invat	Coef.	Robust Std. Err.	t	P>t	[95% Conf.	Interval]
In investment in technology	8.48384	1.561584	5.43	0.001	4.882822	12.08486
_cons	-199.472	42.08357	-4.74	0.001	-296.516	-102.427

Source: Author (2024)

The results in Table 6 indicate that investment in technology is statistically significant in influencing VAT collections in Tanzania. Specifically, a percentage increase of investment in technology by manufacturing firms in Tanzania resulted in an 8.5 percent increase in collections of corporate taxes. Lee et al. (2019), and Ayentimi et al. (2016), in their analyses of the effects of 4IR, concluded that the existing mode of economic catch-up would encounter many challenges with the arrival of 4IR technologies. To begin with, 4IR is rewriting the rules of manufacturing because investment would follow cheap technology, thus facilitating re-shoring of manufacturing back to the developed world. Their analyses did not project witnessing significant growth of either VAT, Corporate Tax or PAYE from the manufacturing sector in developing economies, such as Tanzania. Instead, they expected to witness investment declines, since investment tends to follow cheap and modern technology (found in developed countries), rather than cheap labour and materials (found in many developing countries).

Current study findings reveal significant growth in VAT, Corporate Tax and PAYE from manufacturing firms in Tanzania, which implies growth in the manufacturing sector's productivity that has been expedited by the investment growth in 4IR technologies, as one of the many important factors. These results complement the correlation analysis findings to the effect that investment in modern technology strongly and positively influences VAT, Corporate Tax and PAYE. The implication of these findings is that, as opposed to developed countries, the emergence of 4IR in developing countries that are endowed with cheap resources, such as Tanzania does not necessarily trigger an outward shift of investments and manufacturing to developed countries with cheap technology, as suggested by Lee et al. (2019), Schwabs (2016), and Ayentimi (2019). Instead, it complements cheap materials and labour, accelerates growth of investments, manufacturing and, ultimately, tax revenue collections from the manufacturing sector, for public financing. Therefore, 4IR technologies do not necessarily replace cheap resources in developing countries but rather they complement them. These findings support the first, second and third hypotheses of this study, hence making them acceptable. In short, the findings validate these hypotheses.



CONCLUSION

The main objective of this study was to assess the causality between an investment in modern technology of manufacturing firms in Tanzania and tax revenue collection (Value Added Tax (VAT), Corporate Tax (CT) and Pay-As-You-Earn (PAYE) for the 2012 – 2021 period. The study used primary annual data for the 2012 - 2021 period to estimate the degree of causality and capture the effects of investment on modern technology done by manufacturing firms, and their effects on Corporate Tax, VAT and PAYE. Specifically, the study has found a positive and statistically significant causal effect between investment in modern technology, VAT, Corporate Tax and Employment Tax (PAYE), of the manufacturing firms in Tanzania for the period under review. The estimated correlation coefficient affirms that investment in modern technology and taxes collected from manufacturing firms in Tanzania have a strong positive relationship. Indeed, as investment in modern technology increases, it results in rising tax collection from manufacturing firms, as the upward and positive trend illustrates. The effects of 4IR technologies in Tanzania are, therefore, positive and statistically significant.

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