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PERFORMANCE EVALUATION OF INDUSTRIAL CLUSTERING IN TANZANIA

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Abstract

This study was conducted as a performance evaluation to examine the impact of clustering on the growth of individual firms in an agrarian economy with the case of Tanzania under study. Specifically, it focused on how the employment levels differ across individual firms that are located inside the industrial clusters and across those located outside existing industrial clusters; and how the age of firms influences their growth in clusters and in isolation. It is a critical study that brings answers to questions relating to the current state of Tanzania's industries in terms of clustering of firms and growth of industrial clusters and contributes to policy geared towards growth of the industrial economy. Significant findings confirm that the employment level is high in firms operating in clusters than in the firms operating in isolation. It confirms that a manufacturing firm existing alone in an agrarian economy grows at a slower rate compared to the one operating in a cluster, which highlights the importance of clusters. The study revealed that a firm's age has a positive influence on its growth regardless of whether in a cluster or not in the short-run, but the long run, old firms in isolation can perform well or grow than the old firms in clusters. Key recommendations revolving around good cluster policies and initiatives that encourage clustering of firms to contribute to regional and national economic growth were outlined by the research.

Keywords: Age of firms, employment, firm growth, industrial clusters, isolation.
JEL Codes: L2, L6, D22, J3.

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1. Introduction

Porter (1990) terms a cluster as a collection of firms involved in a similar economic activity or linked economic activities in a given economy. In majority of the cases, such firms are closely located but in others, they appear to be more isolated. Porter's view depicts a belief in the beneficial relationships within two or more industries as the making of a cluster and therefore does not take geographical proximity as a distinct definition of clusters. Other researchers defined clusters a bit differently, but not drifting much from Porter's definition. Rosenfeld and Porter (2000) described industrial clusters as concentrations of interdependent firms such as manufacturers, suppliers, users, and traders who have located in a certain geographical area to manufacture same goods or goods which are closely related.

1.1. Background of the Research

Industrial clusters have rapidly gained substantial attention from research institutions, academicians, and economists due to their role growth of economies. Many studies have found a direct positive link between clustering and up-and-coming industrial growth (Sonobe and Otsuka, 2006; Hayami, 2009; Schmitz and Nadvi, 1999).This points out to the fact that despite the economic times (whether historically or currently), the growth of nations' economies can be globally attributed to firms locating and operating in industrial clusters.

1.2. Global Outlook of Industrial Clusters and Growth of Industries

For the last decade, the world's economy has significantly improved. Developing nations are currently doing well and they continue to contribute more to the global product output. The USA, China and Japan account for around 45 per cent of the world's economy with the United States standing as the biggest economy at an estimated value of $18 trillion. The second biggest contributor is China following at $11 trillion, with Japan following in third position with 4.4 trillion worth of an economy (The World Bank Group, 2016).

China has very large industrial clusters which locate in the most industrialised regions of China. The majority of China's clusters are found in engineering field, banking and finance, information and technology (I.T.), clothes and chemical and pharmaceutical products. Moreover, the country has a network of science parks meant for innovation and technology contributing to an almost unrivalled technological expertise in the country's manufacturing sector (Naughton, 2017). The United States has large industrial clusters manufacturing chemicals, transportation equipment, computers, electronics, instrument-making, textile and non-electrical machinery (Watts, 2019). Japan's economy is export-oriented and has major industrial clusters in the automotive sector and aircraft, food manufacturing, consumer electronics, Information Communications and Technology, energy, iron and steel, bio-industry, pharmaceuticals, advertising companies and shipbuilding industries. Other leading economies that attribute their economic power to industrial clusters include Germany, India, and the United Kingdom, South Korea, France, Israel and Italy. In some countries, all industries operate in clusters. In a country like Taiwan, it is challenging to find any manufacturing industry operating as a single firm away from other manufacturing companies (Sonobe and Otsuka, 2006). In other countries, different companies producing completely different products form clusters to benefit from shared resources such as infrastructure, nearness to financial services, and the domestic

market. Two leading industries in Bangladesh, for example, producing garments and pharmaceuticals, respectively, operate as a cluster (Motteleb and Sonobe, 2011; Amin and Sonobe, 2014).

1.3. Regional Outlook of Industrial Clusters and Growth of Industries

Industrialization in Africa mainly depends on the capacity of the local manufacturing companies to compete with the consumer imported products (Murphy, 2007). However, among the developing nations in Africa, only a few countries have managed to create institutional settings of the right kind, such as financial systems, basic infrastructure to link industries and suppliers/markets, human capital development through appropriate education systems, and training programs for workers. These are the countries that are giving more attention to an upgrade of their production systems to be able to meet domestic demand and foreign demand (Newfarmer *et al.,* 2018). These efforts have proved to be beneficial to the development of industries in these countries. The most notable countries that have backed the promotion of clustering in Africa include South Africa, Morocco, Nigeria, Kenya, Zambia, and Ghana (Lall, 2015).

1.4. Tanzania's Perspective on Industrial Clusters and Growth of Industries

The evolution of the economy of Tanzania is unique, and therefore, it is irrational to categorize its cluster trends among the developed, mixed market, and capitalistic economies. Despite continued efforts by the Tanzanian government to implement some measures of creating a mixed economy, the country has never fully attained a mixed economy status because of the agrarian sector dominance. Majority of processing industries process agricultural products while the majority of manufacturing firms manufacture foodstuffs, which is one attribute of Tanzania that makes the country unique (KPMG, 2018).

Modern clustering approach in Tanzania has been set to inform the SIDP (Sustainable Industrial Development Policy), IIDSMP (Integrated Industrial Development Strategy, the Master Plan), among other strategies and policies in the identification of the enterprises in clusters; analyzing the growth of these enterprises; understanding the linkages or the dynamics of the firms in these clusters; analyzing the trends of growth of clusters and therefore informs the review of policy on industrialization.

1.5. Problem Statement

The existing and emerging literature has majorly focused on clusters in which industrial firms are very near located in mixed economies. Therefore the majority of research has overlooked the consideration that modern clusters are integrated into broader structures beyond their location for them to form building blocks of individual country's economy. Moreover, such studies have not been adequately done in the economies that depend on one or two sectors. For the last few decades, Tanzania has untiringly struggled to achieve the growth of the industrial sector. Nevertheless, knowledge gaps still exist concerning the initiatives of industrial clusters; the link between clustering and growth of individual firms in a cluster as compared to firms in isolation. The latest waves of random trials validate that many of Tanzania's policymakers have inadequate acquaintance regarding the fundamental practices in management that would lead to enforcing important strategies and policies of industrial sector growth. Consequently, critical issues in industrial clusters

and about firm growth across the workers and the owners of firms and workers have not been addressed adequately in Tanzania yet. Insufficient empirical proof of the positive connection between the growth of firms, clustering, and economic growth of a nation has meaningfully contributed to weak and inadequate industrial strategies and policies that have failed to cater to the specific needs of industrial clusters.

1.6. Research Objectives

The overall objective of this study was to examine ways in which industrial clusters enhance individual firms' growth in Tanzania. Specifically, the study intends:

(i) To examine how the rate of growth of employment varies across firms located inside and outside of industrial clusters, and

(ii) To determine the influence of the age of a firm in a cluster and that of a firm in isolation on their growth.

1.7. Significance of the Study

This study primarily aimed at bridging the existing knowledge gap due to insufficient empirical evidence on the link between clustering and firm growth. The findings of this research sought to further inform stakeholders of industrial development and policymakers about the connection between the growth of firms and the clustering of industries. For legislators, clusters can be used as a basis of collecting data and assessing the performance of the regional economies and making necessary recommendations concerning different initiatives of industrial development. With a good background knowledge of the dynamics of firms in clusters, cluster targeting will become manageable, and better strategies and policies of industrial development with the capacity to hasten the growth of firms among firm proprietors and workers at cluster levels will be made.

Knowledge about clustering will be of immense importance to the industries themselves as it will foster solutions to shared problems such as training and modernization of production in individual firms. The paper also contributes to the literature on agglomeration economies by providing a vivid general explanation of the industrial situation in Tanzania about government actions, and actions of other actors in cluster development.

2. Literature Review

From the theoretical literature part, the study majored on Alfred Marshal's Classical Agglomeration Theory. The model describes how economic activities become concentrated owing to the external economies of scale. Marshall claimed that localized concentration of economic activity emanates from three sets of agglomeration advantages: availability of specialized inputs and services, spillovers of technology, and the pooled market for workers. Agglomeration economies give rise to economies of scale at the level of an industry rather than at the level of an individual firm and induces firms to localize near one another (Marshall, 1920). He describes the concept of external economies of scale to expound on the increases in productivity attributable to factors external to individual enterprises. According to Marshall, the producers enjoyed external advantages when costs of shared resources such as infrastructure and services, skilled labour pools, and a specialized supplier pool are shared. When different enterprises of industries relating to

each other cluster, the costs of production might go down because many firms located together require many suppliers who compete with one another, moreover, they become more open to benefit from a pool of highly specialized labor force (Theo and Norberg-Bohm, 2005). Firms benefit more because the cluster in which they operate can attract more suppliers and customers than any single firm could on their own when they exist in isolation (McCann and Folta, 2008). Bekele and Jackson (2006) described the merits of agglomeration, including minimization of transport costs and distance, transport costs, cheap labor, and lessening of risk. The most recent studies describe different linkages that enhance a cluster, including production and marketing connections that exist among industries. Perroux (2017) attributes effective economic policies to those whose focus is investing at a limited number of locations and sectors and those whose objectives are to encourage economic activities that lead to industrial clustering.

From the empirical literature review, the researcher focused on ways in which industrial clusters facilitate regional economic development. The reviewed literature provided some of the reasons such as heightened competitiveness, increased productivity, and stimulation of entrepreneurial partnerships and opportunities. Employment and clustering was discussed. Bathelt (2007) indicates that employment of more workers intensifies the demand for the product in a cluster and triggers demand for labourers among the company's suppliers. He further provides that the employment multiplier in clusters tends to be considerably higher than in non-cluster areas. Many studies linked to the benefits of industrial clustering do not provide a specific link between clustering and reduction of unemployment levels, but most emphasize on the findings that clustering accelerates growth of employment. The empirical review also included a discussion of the power of industrial clusters. Various studies done have discovered the power of clusters as measured by own-sector employment (employment in a company's single two-digit sector within its region), other-sector employment (employment in a company's all other two-digit sectors within its region), and a few other variables such as employment diversity among others (Swann and Prevezer, 1996), (Swann *et al.,* 1998); (Baptista and Swann, 1999); (Beaudry and , Swann 2009); (Pandit *et al.*, 2001), and (Cook *et al.*, 2001). Rosenthal and Strange (2003) noted that the owners of firms have a conviction of being well off when they exist in clusters as compared to when they scatter all over and operating alone. This is because their firms benefit from inter-firm sales, subcontracting, acquisition of inputs, purchase of raw materials, shared technology, shared infrastructure, marketing and sales of goods, and availability of cheap labor for workers all of which contribute to the emergence of more firms and growth of industrial clusters.

The research ends the empirical review by an assessment of the situation of industries in Tanzania, and the economy of the Peoples' republic of Tanzania at large. The research provides that the economy of Tanzania is mainly agrarian, and almost the entire GDP of Tanzania is attributed to agriculture. Tanzania's manufacturing industry is dominated by processors of agricultural produce and the substitution of imports (Pallotti, 2008). The industrial sector in Tanzania is fairly small and the country remains as a low-income country and among a number of African nations with low levels of GDP per capita. As per the World Bank (2019), its GDP in 2019 was worth 63.18 billion US dollars. Despite such a lowly figure, the overall macroeconomic performance of Tanzania has been on an upward trajectory for the last decade, and the country has enjoyed stable economic growth rates in recent years. In Tanzania, cluster effects are most active in the manufacturing

industry as it contributes to around 13% of the country's GDP. The primary challenges that Tanzania faces in its quest to embrace 21st-century manufacturing include inadequate power supply, inadequate research, poor infrastructure, and inadequate policies on clustering.

Currently, a few non-governmental institutions are taking gradual measures to uplift the industrial clusters available in the country. The Tanzania Private Sector Foundation Cluster Competitiveness Programme (TPSF-CCP) is the largest multi-donor trust fund that has significantly contributed to improved competitiveness of the Tanzanian economy, particularly in food processing clusters and horticulture clusters. TPSF-CCP has provided grants to different industries in Tanzania, and has offered industry-specific capacity building to different associations about local competitiveness and capacity of industrial clusters (Kostech, 2016). The government of Sweden has been in constant economic support as it created a partnership with the government of Tanzania to develop Tanzania's economy and lower its reliance on aid from foreign nations. This support is actualized through a Swedish development agency called SIDA (Swedish International Development Cooperation Agency) and it has supported cluster organizations in Tanzania for close to 15 years through an Innovation Systems and Cluster development Program in Tanzania (ISCP-TZ). More than 85 clusters had received support as at the end of 2018. This project has connected clusters to institutes of research and development, and also to technology development centers to add innovation to their daily manufacturing practices. It has helped industries with funds for commencement of different activities that support establishment of clusters. The project has also linked many clustered firms to financial institutions such as banks to help them get access to credit in order to fund production (COSTECH, 2016). Some of the clusters that have largely benefited from this project include the Zanzibar seaweed cluster, Eastern region's mushroom cluster, and Morogoro's rice processing cluster.

Research evaluating the performance of clusters and collaborations of different actors within all clusters included in ISCP-TZ was conducted by Ida Stanberg (2016). The study revealed a gap between firms by finding low levels of collaboration between firms inside clusters. The study also revealed a lack of collaborations and partnership between different industries on one side, and Research and Development institutions, and the members of academia on the other. Low levels of collaborations between the government and the firms were also revealed. For this reason, they have not created links to lobby for enablers such as infrastructure from the government (Stanberg, 2016). Ida further found a capital gap as the findings revealed an average level of collaboration with financial institutions which could provide finances for the development of firms and clusters, and their subsequent growth. This research found the academia gap as well in that there existed an average collaboration between firms in industrial clusters and the academic actors who include universities and bodies of research and development.

3. Methodology

3.1. Econometric Model & Estimation Model

The econometric model used to analyze the growth of firms inside clusters in this study is the lifetime growth model of entry of firms in clusters used by Rosenthal and Strange (2003) to analyze the entrance of new firms, employment and lifetime growth of firms within industrial clusters. This econometric model estimated industrial success using employment as a measure of cluster strength and growth. The model attempts to identify whether firms located in active industrial clusters grow faster than private firms operating in isolation.

The traditional lifetime growth estimation model followed in this study was adopted from Swann (1998), and is outlined as follows:

$$\boldsymbol{ln\, e_{n\in\{1:c\}} = \alpha + \beta age_n + \gamma_1 ln\left[\sum_{i\epsilon\{1:c\}} e_i\right] + \gamma_2 ln\left[\sum_{j\epsilon\{-1:c\}} e_j\right] + u} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$\boldsymbol{\beta = 1 + \sum_{c=1}^{c-1} d_c\, D_c + \sum_{i=1}^{l} d_i\, D_i} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where,

$\boldsymbol{e_{n\in\{1:c\}}}$ is the employment in firm n from an industry I at cluster c, $[\boldsymbol{C_{ie}Emp}]$

$\boldsymbol{age_n}$ is the age of firm n, **[Age]**

$\left[\sum_{i\epsilon\{1:c\}} \boldsymbol{e_i}\right]$ is total employment in an industry I in cluster C, [**OwnEmp**]

$\left[\sum_{j\epsilon\{-1:c\}} \boldsymbol{e_j}\right]$ is the total employment in all industries other than I at cluster C, $[\boldsymbol{OtherEmp}]$

$\boldsymbol{D_c}$ represents cluster dummy variables coded 1 for firms located within a cluster and coded 0, otherwise.

$\boldsymbol{D_i}$Industrial dummy variables coded 1 for firms within industries and coded 0, otherwise.

$\boldsymbol{u}$ is the disturbance term

The modified model is as follows:

$$\boldsymbol{ln C_{ie}\, Emp = \alpha + \beta Age_i + \gamma_1\, ln\,(OwnEmp_i) + \gamma_2\, ln\,(OtherEmp_i) + u} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

3.2. Definition and Measurement of Variables

Own sector employment (OwnEmp) corresponds to the amount of workforce in the region where the manufacturing firms operate and those operating in the same sector as the manufacturing firms. On the other hand, Other-Sector (OtherEmp) reflects all other employees in the selected region except those employed in the manufacturing industry in Tanzania. In this analysis, the most critical variable in the model is the own sector (OwnEmp) and other sectors (OtherEmp) in a given cluster. Own-sector illuminates localization or Marshall-Arrow-Romer externalities and is measured using the number of employees in a firm S, relative to the sectorial number of employees in the chosen cluster.

The variable measured by the sum of the employees in all sectors in the given cluster other than the number of employees in firm S.
The beta (β) variables estimate the trend of growth of a firm that exists alone (in table 1) and the firm that is in a cluster (in table 2). Each of the betas is a coefficient of a given growth variable that explains the growth path of firms in manufacturing. The variables γ illuminate the influence of a company's growth by the availability of similar firms. γ1 represents the presence of same sector firms (ownemp), while γ2 represents different sector firms (OtherEmp).

3.3. Testable Hypothesis

To achieve the specific objectives, the study tested the following hypothesis:
(i) Industrial clusters impact the growth of employment in individual firms positively in Tanzania
(ii) The age of a firm has an influence on its growth

3.4. Type of Data and Sources of Data

This study entirely made use of secondary data. This data was extracted from the National Bureau of Statistics (NBS) in Tanzania for the year 2018. Two types of variables which were identified include Employment which represents the size of a firm and represents the most accurate measure of growth; and data on the number of years that firms have been operating in the market (which represents the age of firms).

3.5 Target Population and Sample Size

The study targeted the major manufacturing and processing firms located in different parts of the entirety of Tanzania's mainland. The study sample was determined by the Fisher formula (Privitera, 2015) given by

$$n = \frac{Z^2 \times p \times (1-p)}{e^2}$$

Where: n is the sample size, z is the normal distribution under a 95% confidence interval, p is the proportion of the major manufacturing firms that have more than 50 employees (Unknown, and therefore 50% will be assumed), and e is the level of precision (10%)

Therefore sample size will be:

$$\text{n} = \frac{1.96^2 \times 0.5 \times (1-0.5)}{0.1^2} = 96.04 \approx 100 \text{ firms}$$ (Rounded off to the nearest 100)

The survey looked into a hundred manufacturing and processing firms with 50 or more workers in Tanzania Mainland. The highest concentrations of such firms are in Dar es Salaam (25), Arusha (17), Mwanza (18), Singida (12), Tanga (13), Kagera (10) and Kilimanjaro (5). The study considered manufacturing to be the same sub-sector with processing. Within this sector, 75 firms engage in the "manufacture of food products, beverage, and tobacco" clusters, with 60 firms solely in food manufacturing clusters. Other clusters include "manufacture of vegetables, animal oils and fats" (15), and "manufacture of grain mill products" (10).

3.6. Methods of Data Analysis

This study uses an econometric technique called Ordinary Least Square (OLS) method, which is applied to equation three (3) to analyze the data. This method was used in this study because it presents the best linear unbiased estimator. The analysis was complemented by descriptive analysis

4. Results, Data Analysis and Discussion

Column 1 in Table 1 shows a simple regression. Column 2 shows regression after adding another employment variable. Column 3 displays the results of regression after adding the age of a firm, and column 4 shows regression results after the inclusion of dummy variables representing the type of ownership.

Table 1. Variable Coefficients for a Firm that is alone in Tanzania

	(1)	(2)	(3)	(4)
VARIABLES	Lnownemp	Lnownemp	lnownemp	Lnownemp
Sgroup	0.791	0.750	0.750	0.748
	(0.00463) ***	(0.00877) ***	(0.00877) ***	(0.00815) ***
Lnother		-160.4	-160.4	-159.7
		(35.82) ***	(35.82) ***	(32.52) ***
o5				0.127
				(0.0259) ***
o6				0.0976
				(0.0618) ***
Constant	0.201	1,814	1,814	1,806
	(0.0116) ***	(405.0) ***	(405.0) ***	(367.8) ***
Multicollinearity		1.41	1.27	1.17
Observations	6,126	6,126	6,126	6,126
R-squared	0.906	0.912	0.912	0.913

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

In table 1, each report presents the results of a single regression. There are four regressions with different combinations of dependent variables. In the first column, we have log (sGroup), which is a simple and bivariate factor in the size of the sGroup and the independent variable. The second regression column incorporates variables for other employment. The third regression includes the age of the firm, while the fourth regression populates data on the ownership of dummy variables. Each of the regressions has 6126 observations obtained from a survey of different regions in Tanzania.

Column1- In the first column, there is one independent variable, which is the number of employees of a firm (which represents its size).
The model has estimated in the first regression is:
$(emp)=\beta 0+ \beta 1(ownemp)+\varepsilon$……1

Where Ɛ represents an error term.
Taking the expected values on both sides and conditioning the independent variable(s)
E[ln (emp)| sGroup]= β0+ β 1(ownemp)+0…….2
Note: in linear regressions, there is an assumption that the expected value of the error term (E(Ɛ|sGroup)=0
Taking the partial derivatives (δ) on both sides,

$$\frac{\delta E(\ln emp|sGroup)}{\delta sGroup}=0+$$

β1=β1…….3

From the table, β1=0.791, exponentiation of β1 yields 2.15. The expression implies that the single company's growth keeps increasing for each year of operation by a factor of 2.15. The stars (*) illuminate the significance of the test (H1: B1=0). Three stars (***) represent the p-value p<0.01, which implies that the result is significant. The number in the parentheses below the coefficient (in this case, 0.00463) is a representation of the t-statistic. Given that the t-statistic<2 in this column, we fail to reject H0 at 5% significant level, implying that the result is insignificant.

The constants 0.201 and (0.00116) *** represent the expected value of ln (emp|sGroup) when the independent variable(s) =0. In other words, they represent β0. From equation (1), when the company is not operating in the respective region, its size will be ln 0.201. The exponential of 0.201=0.5464, which implies that the firm is likely to have a size of 0.5464 immediately after beginning to operate in the respective region. The three equations are critical in the understanding of how a firm operates as a single business rather than a cluster in the region.

Column 2- In the second column, another employment variable is added to the first model. So the model becomes;

ln (emp) = β0 + β1 (ownemp)+ B2 (otheremp) +Ɛ

Taking the partial derivative of the conditional expected value;

$$\Delta' E\left[\frac{\ln emp}{other\ emp}\right] = \beta 2 = -160.4.$$

The exponent of β2 is -157.7, which suggests that the presence of other firms have a significant positive impact on the growth of the firm that exists alone in a region.

Column 3- In the third column, another variable is added to the model. This variable represents the age of the firm.
As stated earlier, the growth path is given by:

ln (emp) = β0 + β1(OwnEmp) + β2(OtherEmp) + β3(age) +Ɛ

Using the procedure above, the expectation (E) of the partial derivative with respect to β3 is 0.0003. The exponentiation of the new coefficient yields 0.0008, which indicates that age has a small, positive significant marginal growth effect to a firm that exists alone.

Table 2. Variable Coefficients for a Firm that is in an active Cluster in Tanzania

	(1)	(2)	(3)	(4)
VARIABLES	Lnownemp	Lnownemp	Lnownemp	Lnownemp
Sgroup	0.749	0.751	0.744	0.750
	(0.00875) ***	(0.00880) ***	(0.00915) ***	(0.00879) ***
Lnother	-160.4	-160.6	-164.0	-160.6
	(35.74) ***	(36.08) ***	(37.13) ***	(35.92) ***
d7	-0.0484			
	(0.0143) ***			
d12	0.0387			
	(0.0211) *			
d19		0.0109		
		(0.00638) *		
d22		0.0709		
		(0.0223) ***		
d23		-0.0476		
		(0.0173) ***		
d24			0.0790	
			(0.0228) ***	
d25			-0.0976	
			(0.0352) ***	
d27			-0.0977	
			(0.0183) ***	
d28				0.0602
				(0.0183) ***
d32				-0.0483
				(0.0182) ***
Constant	1,814	1,817	1,855	1,816
	(404.2) ***	(408.0) ***	(419.9) ***	(406.2) ***
Multicollinearity	1.14	1.16	1.19	1.14
Observations	6,126	6,126	6,126	6,126
R-squared	0.912	0.913	0.913	0.912

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table description: shows regression results when adding cluster dummy variables by regressing them into a group of four in each column. *** p<0.01, ** p<0.05, * p<0.1
The regression model for the growth path in a cluster is as follows;

$$\ln(emp)=B0+B1(ownemp)+B2(inother)+...+\varepsilon$$

In column 1 of table 2, the coefficients imply that the partial derivatives of the model with respect to $\beta1= 0.749$, $\beta2= -160.4$, $\beta3= -0.0484$ and; $\beta4= 0.0387$. Exponentiation of each of the coefficients gives 2.04 for $\beta1$, -157.68 for $\beta2$, 0.1316 for $\beta3$, and 0.11 for $\beta4$.
In column 2 of table 2 the coefficients imply that the partial derivatives of the model with respect to $\beta1= 0.751$, $\beta2= -160.6$, $\beta3= 0.0109$, $\beta4= 0.0709$, $\beta5= -0.0476$. Exponentiation of the beta coefficients gives 2.04 for $\beta1$, -157.88 for $\beta2$, 0.023 for $\beta3$, 0.193 for $\beta4$, and

2.67 for β5. The negative coefficient in the log of β5 indicates a negative marginal effect of entry of a new firm into the cluster.
In Column 3, the coefficients imply that the partial derivatives of the model with respect to β1= 0.744, β2= -164.0, β3= 0.0790, β4= -0.0976, β5= -0.0977. Exponentiation of the factors yields 2.022 for β1, -161.3 for β2, 0.213 for β3, 0.265 for β 4 and 0.266 for β5.
In column 4, the coefficients imply that the partial derivatives of the model with respect to β1= 0.750, β2= -160.6, β3= 0.0602, β4=-0.0483, β5=1.816. Exponentiation of each of the coefficients yields 2.04 for β1, -157.88 for β2, 0.164 for β3, 2.67 for β4 and 4.94 for β5.

4.1. Employment and Growth

The two tables in chapter 3 (Table 1 and 2) posit that the strength of a firm is a function of its age, employment, and other variables specific to the firm. There is a scenario where own-sector employment's coefficient is positive while the coefficients of the other sector remain negative in both tables, implying that the majority of the firms are in the bottom right quadrant despite existing alone or in clusters. The positive coefficient of the own-sector employment suggests a high growth rate of a firm regardless of the cluster it operates in. It means that a firm can be in a generally weak cluster but still have a high growth rate. The Jacobian is negative, which suggests that there is no adverse effect of locating a firm in or out of the cluster, no matter the strength of a cluster or dominance of other sectors. Such an adverse effect is ordinarily associated with intensive competition and congestion in overcrowded clusters. That is to say, firm growth tends to be affected negatively by urbanization.

The two tables demonstrate the magnitude of each parameter's coefficient. To draw reliable conclusions from the results of regression, it is vital to consider both the absolute magnitude and their statistical significance. In table 2, R^2 indicates that the model predicts 95% of the industry. The value obtained after the exponentiation of beta 1 in Table 2 reveals that a single company's growth keeps increasing for each year of operation by a factor of 2.15 indicating that the link between the growth of a firm and its sector employment is positive whenever a firm exists alone in Tanzania's manufacturing sector. Column 2 of Table 2 illuminates the impact of the presence of other firms in the cluster S. Exponentiation of the log of beta 2 yields -157.7, which suggests a substantial negative impact on the growth of a firm. Since the coefficient is negative, it means that the marginal size of the firm decreases when other firms (s) are factored into the growth model of a detached processing or manufacturing firm in this area. Factoring in other firms makes the equation less biased. The negative sign in the second β suggests that factoring in other companies' sizes, irrespective of the sector they belong, drives down the size of the stand-alone firm.

Table 2 presents the growth path of a manufacturing firm operating in a cluster in Tanzania. In the first column, exponentiation of the beta coefficients yields 2.04 for β1, -157.68 for β2, 0.1316 for β3, and 0.11 for β4. The decimal results suggest that firms in a highly active cluster grow at a significantly slower rate in Tanzania. In column 2 of Table 2, the beta coefficients are 2.04 for β1, -157.88 for β2, 0.023 for β3, 0.193 for β4, and 2.67 for β5. Here, the magnitude of the localization coefficients is higher than in the previous

model. It can be deduced that entrance of new firms into a cluster significantly intensifies the rate of growth of a firm in a cluster.
Another vital pattern to note is the trend of the urbanization externalities in the two firms. In table 2, the Jacobian remains stable despite factoring in the age of the firm and the ownership dummy variables. However, in the second table, the coefficient of the Jacobian reduces when more variables related to the firm in cluster S are incorporated into the model. When the own sector employment effect is positive, it implies that the localization externalities (Marshall-Arrow-Romer) are positive. A positive other sector-employment effect is taken as proof for Jacobian externalities or the urbanization scale. In other words, the urbanization rate implies a negative impact on the growth of a single firm. The vice versa still applies. The trend reveals that the localization externalities are higher among firms that operate in clusters as compared to the ones that operate in isolation.

4.2. The Age of a Firm and Growth

To provide the timeframe in the firm growth estimate, the age of the respective firms was calculated from the years they had been operating. In the third column of Table 1, the age of each firm is accounted for in the growth path. The exponentiation of the new coefficient yields 0.0008. The coefficient of time is significantly low relative to the previous ones. The result indicates that age has a positive significance on the marginal growth of a firm that exists alone. However, age-associated growth is negligible in the early years of firms in a cluster and also for those outside clusters up to a point when the aging firms in isolation begin to grow than the aging ones in a cluster. In the third column in table 1, the age of the firms is factored into the growth equation of a firm in an active cluster. The resultant betas are as follows: 2.022 for $\beta 1$, -161.3 for $\beta 2$, 0.213 for $\beta 3$, 0.265 for $\beta 4$ and 0.266 for $\beta 5$. Here, the coefficients of the tables are still rising in this case, which suggests that as a firm grows older in a cluster, its growth rate rises as well. This growth applies uniformly for the firm existing in a cluster and also for the firm operating in isolation. However, this growth continues up to a certain point where the firm in isolation begins performing better than the firm in a cluster, which points to a challenge in clusters in the form of competition from the new and the more innovative firms entering the market.

4.2.1. T-test Analysis

The researcher used a t-test analysis to determine whether there was any difference in the growth of employment between different firms based on the year they started to operate. The test for descriptive statistics investigated the characteristics of the data based on the measures of central tendency and dispersion. The researcher grouped 60 firms into two equal sets. One set had firms that had only been in the market for the last ten years. These were, therefore, firms that began operations from 2008 and were considered to be new. The other set had firms that had been in the market for more than the last ten years. These were firms that began operations before 2008 and were considered to be old firms. The researcher studied the number of employees each set of these firms had employed by 2014 and also by 2019 to identify the difference in the number and the trend.

Different values were seen as recorded in table 3 below. The firms with more than ten years in the industry by December 2014 had a mean of 53 employees, while those that had operated for less than ten years had a mean value of 63. The standard deviations in these

two situations remained high when compared to the mean values indicating that the data values had a big spread.

Table 3. Data Output on Employment Levels as of December 2014

More than ten years		*Less than ten years*	
Mean	53.43333	Mean	61.83333
Standard Error	6.262401	Standard Error	8.34832
Median	43	Median	49
Mode	43	Mode	60
Standard Deviation	34.30058	Standard Deviation	45.72563
Sample Variance	1176.53	Sample Variance	2090.833
Kurtosis	0.807411	Kurtosis	4.234193
Skewness	1.079085	Skewness	2.06107
Range	138	Range	189
Minimum	12	Minimum	11
Maximum	150	Maximum	200
Sum	1603	Sum	1855
Count	30	Count	30

As of December 2019, different values were as recorded in table 3.

According to the t-test analysis done, it is clear that the number of employees for all the companies had increased when compared to the values posted in 2014. It is indicated that all manufacturing firms in clusters and those outside clusters had grown as indicated by them having more employees than in 2014 at a similar time. For the firms that had operated for more than ten years (those that began operations before 2008), their number of employees increased to a mean of 63. For the firms that had operated for less than ten years (those that began operations as from 2008), their number of employees increased to a mean of 90. The mean values show that the number of employees in the new firms (firms that had operated for less than ten years) increased by 29 (from 61 to 90) while the mean values show that the number of employees in the old firms (firms that had operated for more than ten years) increased by only 10 (from 53 to 63).

Table 4. Data Output on Employment Levels as of December 2019

More than ten years		*Less than ten years*	
Mean	63.3	Mean	90.16667
Standard Error	6.289592	Standard Error	14.41065
Median	56.5	Median	62.5
Mode	25	Mode	23
Standard Deviation	34.44951	Standard Deviation	78.93039
Sample Variance	1186.769	Sample Variance	6230.006
Kurtosis	-0.89335	Kurtosis	1.208379
Skewness	0.465465	Skewness	1.494438
Range	121	Range	278
Minimum	15	Minimum	12
Maximum	136	Maximum	290
Sum	1899	Sum	2705
Count	30	Count	30

The study further tested the null and the alternative hypothesis that helped in addressing one of the specific objectives of this study. The null and the alternative hypothesis for this study were as follows:

Null Hypothesis: There is no significant difference between the number of employees for younger and old companies and firms in Tanzania, and therefore, there is no difference in growth between young firms and old firms.

Alternative Hypothesis: The young companies have a high number of employees than the older companies in Tanzania and therefore grow faster than the old firms.

Test result for Firms as at 31st December 2014:

According to the analysis, it was clear that as of December 2014, the value of the t-test was -0.8049, with a p-value of 0.212204. The analysis was done at a 95 percent level of significance, which means that the p-value was compared to 0.05 level of alpha. In this case, the obtained p-value was greater than the alpha value (0.2122>0.05). As a result, there was no sufficient evidence to reject the null hypothesis. Therefore, it was concluded that as of December 2014, there existed no significant difference between the number of employees in both young firms and the old firms. It is worth noting that this being the initial platform for comparison, no difference had been recorded, and therefore, there was

no means through which data on employment could be compared across firms based on their age.

Table 5. T-test: Two-Sample Assuming Unequal Variances for Companies on 31st December 2014

	More than ten years	*Less than ten years*
Mean	53.43333	61.83333
Variance	1176.53	2090.833
Observations	30	30
Hypothesized Mean Difference	0	
Df	54	
t Stat	-0.8049	
P(T<=t) one-tail	0.212204	
t Critical one-tail	1.673565	
P(T<=t) two-tail	0.424408	
t Critical two-tail	2.004879	

Test result for Firms as at 31st December 2019

According to the analysis done, different results from the last test were obtained. At this stage, the study was also carried at alpha 0.05. The t-statistic value was -1.7087, with a p-value of 0.043628. The comparison showed that the calculated p-value was less than the level of alpha (0.043628 <0.05). As a result, this gave the researcher adequate evidence to reject the null hypothesis. A conclusion was therefore made that there existed a significant difference in the number of employees between the young and the old companies as at 31st Dec 2019. This was statistically supported by the fact that the young firms had employed more employees than the old companies by 31st December 2019. Following employment as the best growth indicator in this research, the researcher noted that young firms in Tanzania are growing at a faster rate than the old firms.

Table 6. T-test: Two-Sample Assuming Unequal Variances for Companies on 31st December 2019

	More than ten years	*Less than ten years*
Mean	63.3	90.16667
Variance	1186.769	6230.006
Observations	30	30
Hypothesized Mean Difference	0	
Df	Nv 40	
t Stat	-1.7087	
P(T<=t) one-tail	0.043628	
t Critical one-tail	1.683851	
P(T<=t) two-tail	0.095256	
t Critical two-tail	2.021075	

According to the analysis done, it is clear that the value of the mean employees kept changing. The mean number of the employees in the companies with less than ten years in the market was higher than that of the companies that have operated for over ten years. The values increased as the years went by, and in 5 years, the young companies had a more significant increase in the mean than the old companies.

5. Conclusion

This research confirms that the employment level is high in individual firms operating in clusters than in the individual firms operating in isolation. The research has revealed that a manufacturing firm that exists alone in an economy grows at a slower rate compared to its peers that operate as a cluster. This highlights the importance of locating a firm in an industrial cluster. Despite this study being conducted in a mostly agrarian economy, the researcher concluded that the type of the economy does not matter, and the individual firms in a cluster will show a high level of growth as compared to the individual firms located away from industrial clusters. It is also concluded that a firm's age has a positive influence on its growth regardless of whether in a cluster or not. Specifically, the study found that new and younger firms are employing more individuals than old companies and are growing faster than the older firms, as indicated by their higher employment levels as compared to the old firms. The researcher found one cause of the higher levels of employment among the younger firms than the old firms to be the pressure created by the need to scale up in terms of employment, production, revenue, and size. The second cause was the ability of young to rapidly adapt their strategies to the dynamic conditions of the market as opposed to the old firms. Older firms in Tanzania were found to be very bureaucratic, and the majority have their decision making processes codified lowering

their flexibility. This means that they cannot be able to respond to market changes promptly. The old firms have adopted the strategy of operating 'quietly' whereby they avoid too many risks associated with restructuring, conflicts with their workers, and rigours of research and development, which has resulted in the majority of them lowering their level of performance and losing their competitive advantage, which negatively impacts their growth.

The study recommends promotion of locally produced goods in local businesses to promote growth of local industries; raising of policymakers' awareness on the benefits of developing clusters; exchange of knowledge in and out of the clusters; development of Tanzania's cluster policy and pertinent cluster programs; development of a unique and robust infrastructure; creation an enabling environment for local and foreign investors; strengthen research capacity through initiation of research departments in all industries and capacity building of researchers and cluster management workforce; establishment of a cluster league so that the government matches the support it offers to clusters with their appropriate levels; improved quality labeling; and launching of pilot cluster programs in different regions to revolutionize the clustering of industries and contribute to regional and national economic growth. The researcher identified other aspects of industrial clusters that could be looked into in Tanzania. The study further indorses studies to be undertaken to explore the opportunities available for diversification of the predominant agrarian cluster industries in Tanzania.

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