The Role of Labour Productivity, Manufacturing Sector Output and Export of Finished Goods in Achieving Transformational Productivity in Selected African Countries

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ABSTRACT

In this study transformational productivity refers to the capacity of an economy to attain long term gains in productive capacity by means of structural upgrading, technology adoption and sectoral efficiency gains. In contrast to straightforward productivity indicators, it reflects the efficiency gains inside a sector, as well as transitions to more value-added processes. As a way of operationalizing this concept, the study uses the Productive Capacities Index (PCI) that was developed by UNCTAD, which is a multidimensional measure of productive capabilities such as human capital, infrastructure, institutions, and structural change. This paper analyses the correlation between labour productivity, production in the manufacturing sector and exports of finished goods in the chosen African countries (Nigeria, Kenya, and Ethiopia) based on annual panel data between 2000 and 2022 (N = 69 observations). An ARDL panel framework is embraced to estimate both short and long-run dynamics. Results indicate that despite expected signs of the explanatory variables, the majority of the coefficients are statistically non-significant, which implies that the sectoral performance and transformational productivity are not significantly transmitted by the relevant variables in the sampled economies.. The empirical result showed a negative and insignificant relationship between labour productivity and transformational productivity; a positive but insignificant relationship between manufacturing sector output and transformational productivity; and also a positive and insignificant relationship between export of finished goods and transformational productivity. The study therefore concludes that labour productivity, manufacturing sector output and export of finished goods impacts on transformational productivity but not in a very significant way. If it must impact on it positively as suggested by theories then there is need to look at African dynamics to see how they can be helpful in achieving transformational productivity in Nigeria.

Keywords: Labour productivity, manufacturing sector, transformational productivity

JEL classification code: L25, O14, O47, R11

INTRODUCTION

Transformational productivity which is most times associated with structural transformation is said to be vital towards achieving sustainable development. These two terms though related are different. Transformational productivity focuses on increasing productivity within existing sectors or by adopting new technologies and practices, and also enhancing workforce skills. Structural transformation on the other hand focuses on the process of reallocating economic activity and resources across different sectors, most times from agriculture to industry and to services or put differently – it's a shift in an economy's structure from low productivity activities like agriculture to higher productivity services. These two terms are however interconnected: implying that while structural transformation can lead to transformational productivity (increased productivity) transformational productivity on the other hand can contribute to structural transformation. Transformational

productivity is not merely a rise in the output per worker but rather a qualitative change in the productive structure of an economy such as the technological modernization of an economy, diversification of an economy into more valuable-added production, and strengthening of the institutions.

Page(2012), Rodrik (2014)Acheampong and Vitenu-Sackey (2024) opines that manufacturing sector is one sector that boosts industralisation when compared to other sectors and it lies at the heart of structural change and transformational productivity. Labour productivity according to economic theory is vital in production for without labour capital remains inactive (Tella, 2023). Low productivity which reflects in its low international competitiveness according to UN (2019) has been a major challenge in African countries as the region is lagging in several competitiveness indicators, like attracting foreign investments, penetrating new markets, and diversifying and upgrading its export products. If African countries must take advantage of this agreement it is of vital importance that they boost their competitiveness. Many factors such as- corruption, get-rich-quick syndrome, poor salaries, I-don't-care attitude, money worshipping and bad leadership styles could be said to be responsible for low labour productivity especially for a country like Nigeria*(or countries in Africa)*.

One of the great programs that African is running with is the African union agenda 2063. This agenda hopes to bring about transformation through endogenous means, to harness the continent's comparative advantages such as its people, history and cultures; its natural resources; its position and repositioning in the world to help bring about equitable and people-centred social, economic and technological transformation and the eradication of poverty. According to Chukwuka, et al., (2023), developing the African private sector through engagement and a conducive climate, fostering Pan-African businesses through the growth of regional manufacturing hubs and scaled up intra-Africa trade. Ozoh, Metu, Stephen, and Madueke, (2020) further buttressed the need for enhancing the productivity agenda for Africa, as an essential engine for industrialization, progressively enhancing the competitiveness of the continent in the global economy; and promoting macro-economic policies that facilitate growth, employment creation, investments and industrialization are among the goals that this agenda hopes to achieve.

Export of finished goods is a necessary variable for this study as it is expected to lead to increased productivity. Export of finished goods is expected to have positive impact on the manufacturing sector thereby translating to transformational productivity(Adams, and Klobodu, 2021).It will achieve this by boosting economic growth, creating jobs and increasing foreign exchange earnings. When countries rely on commodity trade it could expose them to adverse international shocks as evidenced by the global financial crises of 2008, the COVID-19 pandemic and even the Russian-Ukraine war; this however does not rule out its importance. Export is important but more importantly having diversified export portfolio (Madueke, et al., 2022). The more diverse a country's export portfolio and the less common and pervasive the products that comprise its export portfolio, the more the productive knowledge embedded in its economy because it will always want to make sure it meets up with the demand from the countries they export to and their standards as the case may be (Akpoghelie, et al., 2025; Hidalgo et al. 2009).

Evidence from Acheampong and Vitenu-Sackey (2024) supports that move of labour from the agriculture sector has been towards lower-value service than towards manufacturing. This makes them to argue that the structural transformation may not be very feasible now but if Africa is to become a player in the global market for manufactured goods then it will have to improve its industrial agglomeration, productive capacities and deploy other sharp trade and industrial policies to its advantage.

According to Bhorat, Kanbur, Rooney and Steenkamp (2017), the Asian story is one where industrialisation and the growth of manufacturing activities acted as a source of growth and employment, can this be said to be true for Africa, and can Africa experience a similar manufacturing-led growth path? These issues raised form the motivation for this study to see if our productive capacities and manufacturing variables are moving Africa towards transformational productivity by selecting some countries in Africa as our discussion targets.

Research Objective:

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1. To assess the impact of labour productivity on transformational productivity in the selected African countries

2. To ascertain how manufacturing sector output impacts on transformational productivity in the selected African countries

3. To investigate the impact of export of finished products on transformational productivity in the selected African countries

LITERATURE REVIEW

Theoretical review: This study is based on structural change theory and productivity capacity index approach.

Structural Change theory is proposed on the notion that developing countries and their economic activities should follow programmes that would transform their domestic economic structures from traditional livelihood agriculture-base to modern economic oriented-base as well as more urbanized and industrially diversified manufacturing sub-sector and be able to compete in the world market (Adeleye, Adedoyin, and Nathaniel, 2021;Stephen et al., 2025). This theory tries to establish the relationship between manufacturing output and economic growth derived as a result of export of manufactured products proceeds in international markets. The theory further stressed that the under development of some countries, especially sub-Sahara Africa is due to the underutilization and exploitation of their human and material resources, which emanated from institutional and structural failures and equally products of both international and domestic dualism. Consequently, the theory advocates structural transformations in lines with the description specified by (Todaro &Smith 2011, Ewa & Lebo, 2019). According to these earlier mentioned scholars, the process of the transformation of underdeveloped economies should be pursued forcefully in such a manner that the manufacturing sector's contribution to national income or gross national product (GNP) will excessively surpass the share of the agricultural sector to the national revenue generation.

Productivity capacity index approach: One of the tools that have been developed by (United Nations Conference on Trade and Development) UNCTAD to measure productivity capability is the productive capacities index (PCI) (McMillan, Rodrik, and Verduzco-Gallo, 2021; Ebele, Stephen, Akpoghelie and Ebuwa 2022). This will serve as a proxy for transformational productivity in this study and is in line with (Hidalgo et al. 2009).The concept of productive capacities was developed by the United Nations Conference on Trade and Development(UNCTAD) in 2006 and is broadly defined asthe productive resources, entrepreneurial capabilities and production linkages that together determine a country's ability to produce goods and services that will helpit grow and develop (UNCTAD, 2006; Akpoghelie, et al., 2025).Economic growth and development is aimed at accumulation of capabilities that allows firms within a country to produce increasingly complex products. These increasingly complex products are typically manufactured products. This supports that there is a link between economic complexity (productive capabilities) and manufacturing. There is relationship between a country's productive capabilities, measured as economic complexity, and the number of manufacturing products that it produces. The PCI data is available for 194 countries from 2000 to 2022.

The use of PCI as a proxy of transformational productivity is informed by its multidimensional form of structure that is consistent with the theoretical principles of structural change and accumulation of capabilities. Compared to single-factor productivity measures, PCI comprises of systemic character of productive transformation by including factors like human capital, infrastructure, development of the private sector and structural change. Thus, it has a greater empirical representation of transformational productivity.

Manufacturing sector:

Manufacturing is one of the industrial sub sectors in Nigeria. An industrial sector is a group of firms involved

in similar production line, service line and of business interest. According to Adofu et al (2015) manufacturing sector is viewed as the sector that is responsible for the production of goods for sale or use through the

application of tools, machine, labour, chemical and biological formulation. It involves both human handicraft activities and high tech through which raw materials are transformed into finished products in large scale. Adebayo (2010) on the other hand defined manufacturing sector as those industries which are involved in the manufacturing and processing of items; which indulge or give free rein in either the creation of new commodities or in value addition. Eze and Ogiji (2013) defined manufacturing sector as any economic unit that processes or creates new commodities through the transformation of raw materials or semi-finished goods. So many attempts have been made to see how to boost the economy through the manufacturing sector growth in Africa but yet no breakthrough. This could be tied to some challenges which includes; infrastructural deficiencies, access to finance, skills gap and human capital development, trade barriers and tariff, political instability and security concerns, technology adoption and innovation, energy access and reliability and, regulatory environment and red tape (Global Africa network 2024; Madueke, et al., 2022).

Labour productivity: Labour productivity is defined as output per unit of labour input (persons engaged or hours worked). It measures the efficiency of a country with which inputs are used in an economy to produce goods and services and it offers a measure of economic growth, competitiveness, and living standards within a country.

Empirical review:

The discussion on manufacturing sector and transformational productivity is not new. Extant literature has tried to discuss the various components of manufacturing sector and how it relates to transformational productivity. Atkin (2014) and Madueke, et al., (2022) investigated how export increases business productivity in Egypt by applying the random control treatment. They ran periodic surveys to collect data on both treatment and control firms. In addition to measures of quantities and prices for both outputs and inputs, our production-line level data allowed us to record detailed specifications for the rugs being produced at the time of each survey round. They found that the opportunity to export raises firm profits by between 15 and 25%, depending on the profit measure; also, that that exporting induces a movement along the production possibilities frontier. They were however careful not to generalize their findings because of the randomized control trial tool that was used.

Ayala (2014) provided evidence for the manufacturing as an engine of growth hypothesis by using an econometric technique (system GMM) that treats endogeneity bias for a sample of 119 countries over the period 1990-2011. By extending the same approach to the services sector, the thesis analysed if it can also be considered a growth escalator and finds strong confirmation for this. They derive results for countries by income levels and show that manufacturing is the only engine of growth for low-income economies, while for middle income countries both sectors can be consider a source of growth. In the case of high-income nations manufacturing does not explain overall growth anymore, but services play the major role.

The analysis of Bhorat, Kanbur, Rooney and Steenkamp (2017) where they analysed manufacturing employment complexities between sub-Saharan countries and East and South Asian countries, shows a sub-Saharan African productive structure that is disconnected and characterized by products with low levels of economic complexity. Inherent in a productive structure characterized by lower levels of economic complexity is the notion of limited productive capabilities. This according to their study stands in contrast to an East and South Asian productive structure that is connected and complex. East Asian economies are able to shift in to increasingly complex manufactured products because the productive capabilities imbedded in their existing productive structure are similar to those required in order to shift in to these products. They therefore concluded that if Africa is to generate jobs through manufacturing led industrialisation it needs to accumulate the productive capabilities that will allow it to do so.

Using a static panel regression analysis, Ogundipe and Olarewaju (2020) examined the effect of labour (controlled for technology) onmanu facturing sector performance in ECOWAS region from 1990 to 2019. Their findings showed that on the average, when controlled for technology, labour productivity significantly influenced manufacturing sector in ECOWAS. Specifically, the availability of secure internet servers and

individuals' internet usage were more important and positively stimulate the influence of labour productivity on manufacturing output in the region.

UNCTAD (2025) in their study on Ethiopia's productive capacity observed that Ethiopia has made progress as captured by its performance in the overall Productive Capacities Index (PCI) over the past two decades, the country's PCI score has remained low compared to many other sub-Saharan African countries, including those located in close geographic proximity such as Kenya, Rwanda and Tanzania, slightly lower than the median for the least developed countries (LDCs) and far behind landlocked developing countries(LLDCs) and other developing countries (ODCs). In 2022, Ethiopia ranked 169th out of 194 economies and territories in the overall PCI. Ethiopia's performance in the PCI is dragged down by its weak performance in institutions, human capital, energy, and ICT, as well as manufacturing value-added in GDP, and dependence on the production and export of low-value agricultural commodities, with little or no technological sophistication.

UNCTAD (2025) in investigating the productive capabilities in Kenya, observed that Kenya as a perceived regional leader in Africa in terms of development, having achieved above-average growth rates and having become a lower middle-income economy in 2014 still has a lot to do as regards growing their PCI though they can be said to have made some improvement. As far as building productive capacities is concerned, Kenya's overall PCI score has been gradually improving from 24.6 in the year 2000 to 37.8 in 2022. This has made the country to remain with a higher ranking than the average for Sub-Saharan Africa (SAA) (31.6)and its neighbours, such as Ethiopia (30.5), Tanzania (31.9) and Uganda (21.4). The finding sreveals substantial potential to advance the country's socio-economic development (as per scores concerning institutions and structural Change), but also profound challenges (as per scores concerned with the infrastructure-related components of the PCI, such as transport and energy), which may impede the development process. The study suggests that to boost their economy via transformational productivity some of these development policies needs to be emphasized: (i) prioritise productive capacities for structural transformation, (ii) enhance industrialisation and structural change, and incentivise developing manufacturing, (iii) transform and modernize agriculture, (iv) ensure preservation of natural environment by sustainable use of resources among others.

METHODOLOGY

This paper employed panel Autoregressive Distributed Lag (Panel ARDL) model to estimate both short term and long term relationships between the variables., to investigate the link between transformational productivity, labour productivity, output from the manufacturing sector, exports of final goods, technology, and unemployment in some African countries. Data were sourced from WDI, CBN, NBS and IMF. It employs panel data of three countries in Africa (Nigeria, Kenya, and Ethiopia) during the years 2000-2022. This gives a balanced panel of 69 observations. The World Development Indicators (WDI) and UNCTAD databases were the sources of data. All variables were put in logarithmic form where necessary to make them comparable and minimize heteroskedasticity.

The statistical model is $TP = f(LP, MSO, EFG, T, U)$ - - - - 1

Where

TP - Transformational Productivity (PCI)

LP - Labour Productivity (the output per labor input)

MSO - Manufacturing Sector Output (the value added by manufacturing sector)

EFG - Export of Finished Goods (The value of finished goods that is exported)

T - Technology (technological advancement influence)

U - Unemployment (market conditions regards to labor)

The statistical model is$TP = f(LP, MSO, EFG, T, U)$ shows the strong connection between these variables in promoting major productivity changes, each part is important in contributing to the final result of this paper. Furthermore, it is worthy to note that better labour productivity gives the workers better ways to work. We can deduce how healthy the industrial sector is when we have a clear understanding of the view of MSO. The benefit of exporting finished products includes finding more markets and strengthening the economy. Innovation and working more efficiently are possible, thanks to technology. The condition of unemployment alters the number of available workers and can upset the economy's stability.

$$LP = \frac{O}{L} \quad - \quad - \quad - \quad - \quad - \quad - \quad 2$$

Where

O - Total produced output

L - Total input of labor (hours worked by workers or number of workers)

The equation explains that labour productivity means the output for each unit of labor. The analysis displays workers' proficiency at making goods and delivering services from labour. Better use of employees is shown by higher scores and helps achieve major productivity improvements.

$$MSO = \sum(Vi) - \quad - \quad - \quad - \quad - \quad 3$$

Where:

Vi - The increase in value brought by different industrial sectors

This sums up the contribution made by various sectors in the manufacturing process. It points out that a broad range of manufacturing products helps improve the performance of the industry, which is key to the country's economic growth.

$$EFG = \sum P_j \; x \; Q_j \quad - \quad - \quad - \quad - \quad 4$$

Where:

- P_j - Represents each finished good price
- Q_j - Represents export quantity of each finished good

This computes the total value of goods that are ready for exporting. This means price and volume are important for good export results, supporting both the economy's growth and the rise in productivity.

$$T = f(I, R \& D, A) \quad - \quad - \quad - \quad - \quad - \quad 5$$

Where

I - Technology Investment

R & D - Research and development expenditure

A - Adoption rate of new technologies

T reveals that technology (T) increases with increasing investments, research, and the rate. It stresses that a company's productivity and competitiveness are improved through ongoing improvements and new technologies.

$$U = \frac{N-E}{N} \quad - \quad - \quad - \quad - \quad - \quad 6$$

N - Total labor force

E - Employment level

This shows that the unemployment rate is found by relating it to the size of the labor force. It shows the need for less unemployment to help the economy grow and work at a high level.

$$PCI = f(HP, EC, SC) \quad - \quad - \quad - \quad - \quad 7$$

Where:

HP - People's education and the skills they have

EC - The number of products and services a country offers

SC - Infrastructure and institutions layout

The equation identifies the PCI as a mixture of human capital, how economically complex countries are, and their structural skills. It underlines that transformational productivity means working on many areas and improving them. (*Note that PCI which represents productivity capacity index is used to proxy transformational productivity in this study*)

$$TP = \alpha LP + \beta MSO + \gamma EFG + \delta T - \epsilon U \quad - \quad - \quad - \quad - \quad 8$$

Where

$\alpha, \beta, \gamma, \delta, \epsilon$ - *Represents the coefficients sensitivity of variable TP*

Here, transformational productivity (TP) is seen as the addition of several other variables, which makes it easy to see how each one plays a role. These coefficients show how every variable is related to transformational productivity.

This model offers all the necessary tools to study how productivity is transforming. All the equations further explain how different factors are connected and affect one another. Looking at these relationships, policymakers can make decisions to boost productivity, the country's goods made, and exports in the chosen countries. With this approach, the nation can make better strategies for economic growth(Nkoro, and Uko,2016; Pesaran, Shin, and Smith, 2001; Akpoghelie, et al., 2025).

Presentation of results

Table 1: Descriptive statistics result

	TP	U	T	MSO	LP	EFG
Mean	96.63622	8.427652	2.61E+09	87.88752	92.48065	94.12770
Median	97.06700	8.102000	2.43E+09	83.42800	94.47600	76.92932
Maximum	105.2250	10.85100	1.14E+10	114.4570	111.5840	231.0010
Minimum	87.22900	6.010000	1.68E+08	68.23300	71.54900	19.62493
Std.Dev.	4.809783	1.090680	2.45E+09	13.88273	11.33175	72.39720
Skewness	-0.313483	0.529667	2.130759	0.361498	-0.133425	0.614730
Kurtosis	2.558879	3.398321	8.431961	2.040476	2.196577	1.979877
Jarque-Bera	0.563187	1.227480	45.68061	1.383269	0.686835	2.445880
Probability	0.754580	0.541323	0.000000	0.500757	0.709342	0.294364

Sum	2222.633	193.8360	6.01E+10	2021.413	2127.055	2164.937
SumSq.Dev.	508.9482	26.17083	1.32E+20	4240.062	2824.988	115309.8
Observations	23	23	23	23	23	23

Source: authors computer using EViews version 12

The descriptive analysis gives a clear picture of dynamics of transformational productivity and factors that influence it in the chosen countries in Africa. A large variation in the variables would mean different economic situations and performances in the region. The knowledge of these characteristics will be essential in designing specific policies meant to improve transformational productivity and confronting the challenges experienced by these economies.

Transformational Productivity (TP) mean is 96.64 indicating that productivity score is moderately high in the sample. This is an indication that the countries covered in the analysis are realizing a respectable mark of productivity on average. Its median of 97.07 is a little bit more than the mean indicating a symmetrical distribution of TP scores, where the extreme values do not influence the mean much. The maximum and minimum value with a high score of 105.23, transformational productivity is the highest transformational productivity that was recorded and a low score of 87.23 represents the lowest transformational productivity recorded. The variability among the countries is expressed by the range (maximum - minimum) which is significant. The standard deviation with a value of 4.81 is fairly small, which implies that the TP scores are dispersed closely around the mean value showing that all the individuals in the sample have similar productivity levels.

The Skewness value of 0.31 indicates that there is a small left tail, which implies that there are one or few lower TP values that could be taking the mean towards it. The Kurtosis value of 2.56, gives a distribution that is a little flatter than the standard distribution, or in other words, it has fewer extreme values. Jarque Berra Statistic is 0.56 (p = 0.75). The probability value is high indicating that TP variable is normally distributed. The unemployment (U) mean value of 8.43% shows that the sample countries have a moderate rate of unemployment, which could be a cause of concern as far as the productivity of the economy is concerned. The median value of 8.10% is a little bit less than mean which reveals that there are one or few countries with high rates of unemployment which are influencing the average. The maximum and minimum rate of 10.85 and the lowest 6.01 indicate a high discrepancy in the unemployment level within the sample. Standard Deviation value of 1.09 is relatively low and it implies that the majority of countries are characterized by unemployment rates that are not far away from the mean.

The skewness value of 0.53 shows a positive and indicates the existence of several countries with much higher rates of unemployment. The Kurtosis 3.40 value is near to 3 which means that the distribution is approximate to normal with a moderate number of outliers. The Jarque Berra Statistic is 1.23 (p = 0.54) indicating that the probability value is high which shows that the variable of unemployment is normally distributed. The technology (T) with a mean of 2.61billion indicates that the amount of technological investments implies great amounts of resources invested in technology development, which is essential in increasing productivity. Median value of 2.43billion suggests that there could be a skew on the average values of technology by a few countries with very high values of technology. The maximum and minimum highest figure of 11.4 billion implies that there are high technological investments in certain countries and the lowest figure of 168 million implies low investment in other countries.

Unit root test

Table 2: Summary of unit root test results

Variable	**t-Statistics**	**ADF 5%**	ADF 1%	**1(0)**	**1(1)**	**Prob.**	**Decision**
TP	-8.124431	-3.594244	-4.319824		**	0.0000	1(1)
U	-7.544211	-3.673033	-4.426345	*		0.0000	1(0)

T	-5.181501	-3.545026	-4.336068		**	0.0015	1(1)
MSO	-3.547920	-3.594244	-4.319824	*		0.0229	1(0)
LP	-4.094398	-3.544244	-4.329824		**	0.0141	1(1)
EFG	-4.384123	-3.560622	-4.313979	*		0.0075	1(0)

Source: Authors computation using EViews

The order of mixed integration of the unit root test results confirms that ARDL is suitable for this study analysis. The combination of I(0) and I(1) indicates that some variables are stationary at levels (I(0)) and others stationary at (I(1)). U, MSO, and EFG are stationary at level while TP, T and LP were stationary at first difference. This justified the conditions to use the ARDL as estimation technique in this study as certified by (Nwokoye, Chukwuka,Akpoghelie and Ebuwa, 2022).

ARDL Bound Test

The existence of long-run relationships among the variables was tested using the ARDL bounds testing. The obtained F-statistic was compared to the values of critical bounds. These findings confirm the existence of the long-run relationship between the variables, which supports the estimation of both long-run and short-run coefficient as an ARDL model.

Table 3: Summary of ARDL bound test results

Date: 06/12/25 Time: 19:31 Sample (adjusted): 2002 2022
Included observations: 21 after adjustments Trend assumption: Linear deterministic trend Series: TP U T MSO LP EFG
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.993394	194.6149	95.75366	0.0000
At most 1 *	0.856099	89.19973	69.81889	0.0007
At most 2 *	0.629429	48.48858	47.85613	0.0435
At most 3	0.596878	27.64166	29.79707	0.0869
At most 4	0.279534	8.562846	15.49471	0.4073
At most 5	0.076789	1.677847	3.841465	0.1952

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.993394	105.4151	40.07757	0.0000
At most 1 *	0.856099	40.71116	33.87687	0.0066
At most 2 **	0.629429	20.84691	27.58434	0.0056
At most 3 **	0.596878	19.07882	21.13162	0.0046
At most 4 **	0.279534	6.884999	14.26460	0.0008
At most 5	0.076789	1.677847	3.841465	0.1952

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

Variable	CE1	CE2	CE3	CE4	CE5	CE6	D(CE1)	D(CE2)	D(CE3)	D(CE4)	D(CE5)	D(CE6)

TP	1.974118	0.901506	-4.04E-10	-0.168812	-0.864596	0.038599	0.093505	0.189199	0.148922	-0.299968	-0.241681	0.036996
U	-0.159319	1.148931	-7.61E-10	0.015050	0.178198	-0.055279	0.164131	-0.120151	0.077726	-0.044767	0.096244	0.037179
T	0.362368	-2.938311	-9.66E-11	-0.117994	-0.019704	0.032012	1.14E+09	1.36E+09	5.21E+08	1.02E+09	-3.52E+08	37984470
MSO	1.870779	0.945100	-4.12E-10	-0.116267	-0.530432	-0.007891	-0.955598	0.546429	0.577230	-0.238898	-0.652108	0.102640
LP	0.757520	-1.326469	-6.31E-11	0.325126	-0.496458	-0.020463	1.040318	-0.371965	-0.329174	-0.168934	0.071044	-0.011102
EFG	-2.216596	-3.966720	4.88E-12	0.969043	0.348042	-0.033280	-12.85537	4.178563	-6.239707	-1.380157	-4.697733	4.126264

Source: Authors computation using EViews

The findings of the unrestricted cointegration rank test (trace and maximum eigen value tests) based gives some idea with regard to the relationship that existed on a long run basis of the variables in the analysis (Transformational Productivity, Unemployment, Technology, Manufacturing Sector Output, Labour Productivity, and Exports of Finished Goods). Furthermore, the results of the Trace test of 0.05 probability level implies that there exist 3 cointegrating equations and there exist long-run relationships among the variables. Maximum Eigenvalue test depicts three cointegrating equations at the level of 0.05 which also shows the presence of long-run relationships. The normalized cointegration equations show that the long-run relationships between the variables by means of its coefficients. For example, the positive influences on TP include unemployment (U), the presence of a positive coefficient (0.901506) indicates that unemployment has a statistically significant positive effect on the transformational productivity and this may not be an intuitive factor in the calculations hence needs to be researched further.

The Negative Impacts such as the value of the coefficient of Manufacturing Sector Output (MSO) and Labour Productivity (LP) are negative (-0.168812 and -0.864596respectively), so the increase in these variables can be associated with the drop in TP. This indicates that although they play one of the most vital roles in the production factor, their input might not be adequate to facilitate future productivity improvement.

The ARDL results

Table 4: Summary of ARDL results

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
TP	-0.173749	0.312135	-0.556648	0.6018
U	0.346661	0.285309	1.215035	0.2786
T	1.091138	0.640774	1.702845	0.3380
MSO	0.547688	0.311594	1.757695	0.3293
LP	-0.605668	0.433766	-1.396300	0.2214
EFG	1.769969	0.981421	1.803475	0.1312
TP (-1)	-0.145120	1.358158	-0.106851	0.9191
U (-2)	-1.690566	1.928360	-0.876686	0.4208
T (-3)	2.501709	1.665473	1.502102	0.1934
MSO (-4)	6.66E-11	1.01E-10	0.661466	0.5376
LP (-5)	-7.12E-11	7.98E-11	-0.892443	0.4130
EFG (-6)	-2.93E-11	9.61E-11	-0.304600	0.7729
T	12.91E-10	8.52E-11	-3.414836	0.0129
C	29.12010	8.422456	3.457436	0.0141
R-squared	0.991515	Mean dependent var		98.27858
Adjusted R-squared	0.969454	S.D. dependent var		3.365974
S.E. of regression	0.588282	Akaike info criterion		1.915461
Sum squared resid	1.730376	Schwarz criterion		2.611364
Log likelihood	-4.196881	Hannan-Quinn criter.		2.033236
F-statistic	44.94480	Durbin-Watson stat		1.980201
Prob(F-statistic)	0.000270			

Source: Authors computation using EViews software

The long-run coefficients show that labour productivity, output of manufacturing sector has negative relations with transformational productivity but this is not statistically significant. The short run dynamics, which are represented by the error correction representation, show that the correction of deviations of the long-run equilibrium is slow with the error correction term (ECT) usually being negative and large. Most short-run coefficients are however found to be insignificant implying that the sampled economies have weak adjustment mechanisms.

The interpretation of the ARDL outcomes accessed in Table 4, reveals influential inferences concerning the connection between the concept of transformational productivity (TP) and those elements of its relationship, i.e., controllers, namely, unemployment (U), technology (T), manufacturing industry output (MSO), labor productivity (LP), as well as exports of manufactured goods (EFG).

Transformational Productivity (TP): The TP coefficient value is -0.173749 which implies that there is a negative relationship. But the results indicate that this relationship is not significant since the p-value is high (0.6018). This is to say how transformational productivity changes do not relate very well to its past values over the sample period.

Unemployment (U): The value of the coefficient of unemployment is (0.346661) indicating a positive correlation between unemployment and transformational productivity. However, from the results, the p-value equal to 0.2786, and so the study concludes that the given relationship is not statistically significant, which means that the changes of unemployment may not show any definite effect on the level of productivity.

Technology (T): The coefficient used (1.091138) shows that it has a positive impact on transformational productivity. Nevertheless, it is showing that the p-value (0.3380) also points to the fact that this finding is not significant. Therefore, on the one hand, technology seems to be helpful; however, its effects are not so solid to make firm conclusions.

Manufacturing Sector Output (MSO): Coefficient of MSO is 0.547688 indicating that the increment in manufacturing output may facilitate the transformational productivity. However, this correlation is not statistically significant as p-value is 0.3293 producing the impression that the impact of manufacturing output upon the productivity can be lower than expected.

Labor Productivity (LP): The coefficient of labor productivity is greater than 0, that is, -0.605668 and this relationship represents a negative association between labor productivity and transformational productivity. Based on the p-value of 0.2214, the result does not imply any statistical significance and this begs the question regarding the usefulness of the improvement in labor productivity as an effective measure in enhancing overall productivity.

Exports of Finished Goods (EFG): The coefficient of 1.769969 has the implication of a positive relationship with transformational productivity. But as the p-value indicates 0.1312, the effect is not statistically significant indicating that, though there might be a positive influence of exports there are no significant data to confirm the same.

Long-Term Dynamics: In carrying out the lagged variables analysis, we observe that none of the lagged variable of TP, U, T, MSO, LP, and EFG have statistically significant effect on transformational productivity such that past value of these variables does not have any significant impact on current productivity.

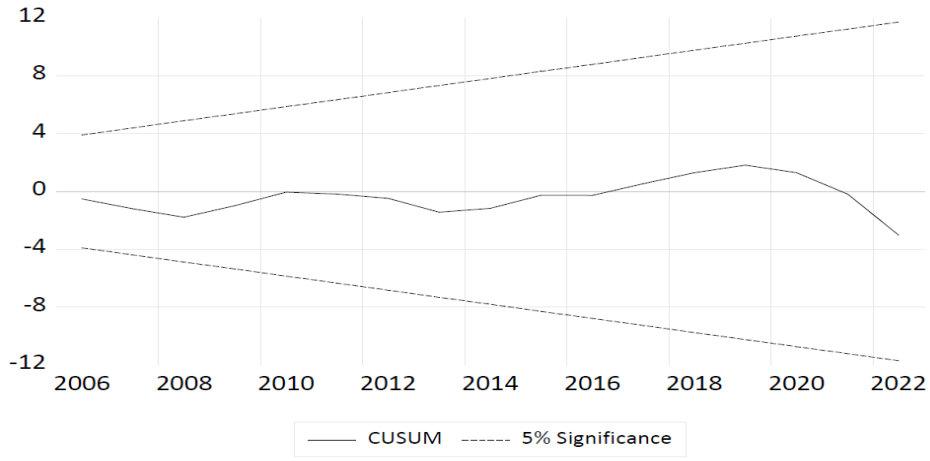
Model Fit: The R squared value of 0.991515 signifies that the model is indicating a significant share in explaining transformational productivity hence the model is fitting well. The final value of the adjusted R-squared as 0.969454 and F-statistic as 44.94480 (p-value = 0.000270) re-enforces the overall significance of the model.

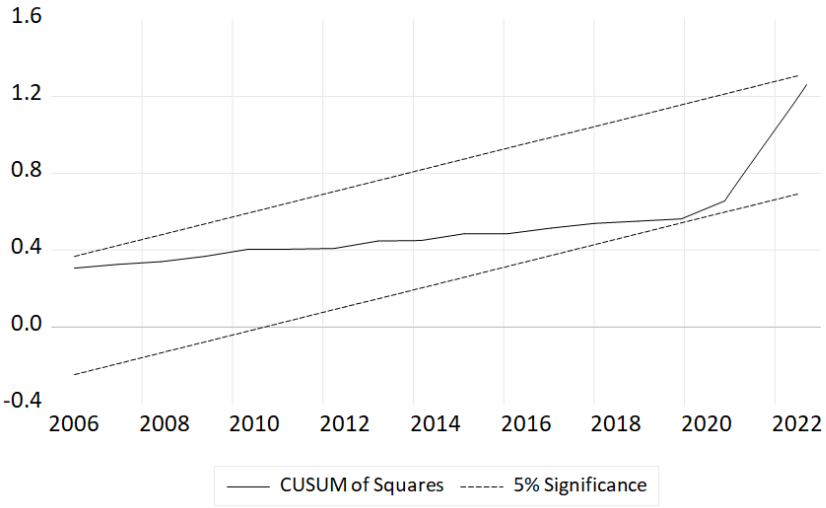
Finally, despite the positive patterns and associations between transformational productivity and its factors, obtained with the analysis, the insignificance of the statistical value of most variables indicates the need to continue the research. This may lead to extended variables, time periods and data granularity with the view of getting a better idea of what happens in the background of transformational productivity in the countries of choice in Africa.

Constant (C): The constant has a value of 29.12010 with a p-value of 0.0141, and it means that there is significant amount of transformational productivity at the baseline even without considering other variables.

CUSUM and CUSUMQ test

Figure 1: Summary CUSUM and CUSUMQ diagnostic test results





Source: Authors computation using EViews version 12

The test outcome of the CUSUM and CUSUMSQ is an elucidation of the fact that the recursive residuals are not only normal but also within the 5 percent significant lines. This means that there is no structural change or misspecification that occurred in the estimated model and this is also an indication and evidence that shows that the stability of the estimated coefficients is checked.

Stability Indication: This means that there has been no major change in the coefficients of this model in case the CUSUM lies in the accepted confines. In the present case, it reveals that there is stability in the relationship between the dependent variable (such as transformational productivity) and its predictors (such as unemployment, technology and so on) over the period of interest. The reason behind the CUSUM Test is to

test the hypothesis of a difference between null and zero. The main focus of the CUSUM test is to know whether the coefficients estimated in a regression model are sound throughout the stipulated period of the sample. Stability here implies that the assumptions made in the model remain to be valid during the period of analysis.

CONCLUSION

In this paper, the interconnection among labour productivity, output of the manufacturing sector, and export of finished products as the key drivers of transformational productivity within a set of African countries (namely Kenya, Ethiopia and Nigeria) was examined. The results show that the theoretically significant variables are labour productivity, manufacturing sector output and export of finished goods whose estimated impacts on transformational productivity are statistically insignificant. This implies low level of empirical support of their functions as important mechanisms of transformational productivity within the sampled African states. The determinants of productivity include unemployment; technological investments and the manufacturing industry hence are important factors in determining productivity results. Yet, the negative correlation that emerged between transformational productivity and some of the variables, especially the labour productivity and production of the manufacturing sector, reveals the importance to have a more sophisticated presumption about the dynamics of the African economic transformation. This means that there might be other structural and institutional forces that are not included in the model but they might have a greater influence in transformational productivity.

RECOMMENDATIONS

African countries ought to adopt specific measures toward labour productivity by ensuring creation of skills and training programs. This entails an invention of culture of constant learning and innovation of workforce to make sure that the employees are well prepared to embrace the new technology and practices. The governments need to give focus to the manufacturing industry through investments in infrastructure, offering financial incentives, and making it easier to access technology. This will be done by involving the private-public partnerships and this will spur industrialization and also help in local manufacturing promotions.

Countries need to have diversification in their export level in order to reduce the risks linked with being dependent on commodity exports. This means encouraging the production of finished products of higher value, which conform to international standards hence the increase in competitiveness in the international markets. It is paramount to invest more in research and development (R&D) in order to become innovative. Governments and the private sector ought to work together in order to establish an environment that favors a technological boost which enhances efficient production and goods quality.

Creating harmonization between African Union policy and national policy-aligning national policies to the African Union 2063 Agenda is a way of maximizing cooperation in the region. This agenda focuses on that of sustainable development, economic diversification and industrialization that are important, in order to be transformed in terms of productivity. An elaborate monitoring and evaluation structures should be implemented to determine effectiveness of policies that are meant to enhance productivity. The regular evaluation will allow obtaining information about the effectiveness of interventions and making the needed changes to approaches.

It is through these recommendations that the African countries will be in a position to set the stage of having a more vibrant and sustainable manufacturing sector that will effectively sustain the economic growth and development the continent so desires through this transformational productivity.

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