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THE NEXUS BETWEEN LABOUR PRODUCTIVITY AND AGRICULTURAL DEVELOPMENT IN SUB-SAHARAN AFRICA (1991-2021)

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Abstracts

This study examined the relationship between labour productivity and agricultural agriculture development in Sub-Saharan Africa (SSA) from 1991 to 2021. The study is based cross-sectional data covering the period 1991-2021 on nine (9) SSA countries sourced from the World Bank Development Indicator (WDI) database. The result of the Panel Dynamic Least Squares (POLS) estimation technique utilised revealed that population growth (β = 0.0203, t-value = 2.092, & Prob. = 0.0398) exerts a significant positive effect on agricultural development while both industrial output (β = -0.8698, t-value = -2.1225, & Prob. = 0.0371) and services productivity (-1.2667, t-value = -2.6510, & Prob. = 0.0098) exert a significant negative effect at 5% level of significance. Although, the effect of labour productivity on agricultural development is negative (β = -0.2335, t-value = -0.949, Prob. = 0.3455), it is not statistically significant. Thus, the low productivity in industrial sector and the structural shift in favour of services posed adverse effect on agricultural productivity in SSA. This underscore the need to maximise the potentials of the population growth through policy options including rural infrastructural development, price supports, crop insurance and tax incentives to stabilise income and make the sector attractive to the labour force.

Keywords: *Labour productivity, Agricultural development, Industrialisation, Sub-Saharan Africa, Panel Dynamic Least Squares (POLS)*
Jel Codes: *E24, O13, O14, C33*

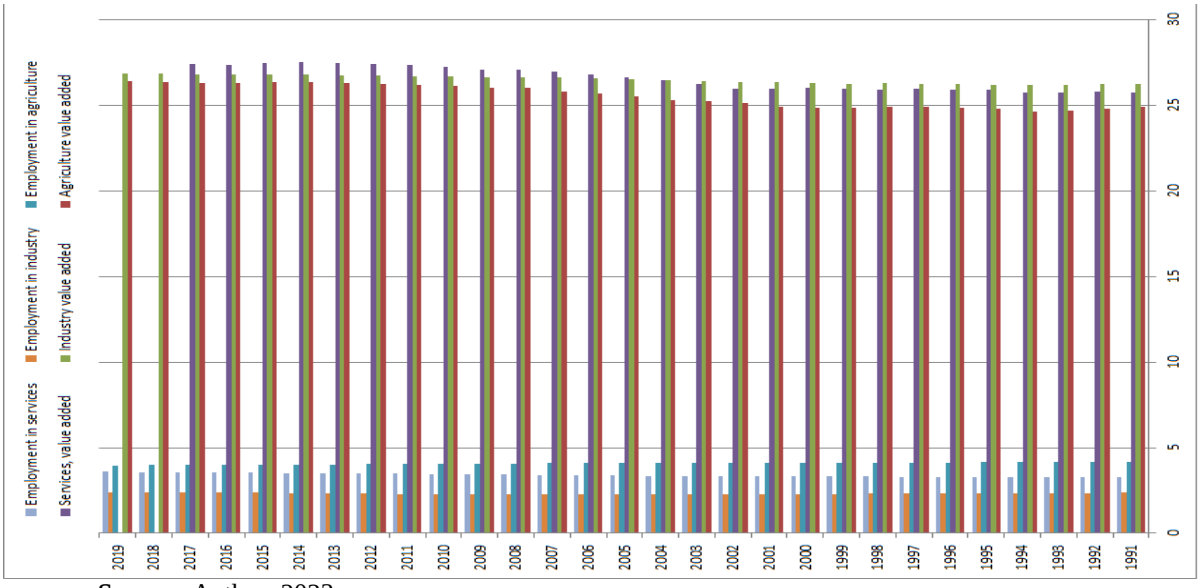
1. Introduction

The agricultural sector plays a crucial role in economic growth and development by providing food, raw materials, and essential resources for productivity. It facilitates sectoral linkage, enhanced industrialization, and job creation in developing countries. Structural transformation, characterized by the reallocation of resources from agriculture to modern economic activities, is a key feature of economic development. This reallocation of labour and resources from agriculture to other sectors is imperative for overall productivity and income generation (Awoyemi, Afolabi & Akomolafe, 2017). Higher productivity in industry and

services sectors brings about higher value added compared to agriculture and this in turn bring-down employment in agriculture and stimulate overall growth and development (Alvarez-Cuadrado & Poschke, 2008).

The trend of labour movement from agriculture to industry in many developed regions has resulted in a corresponding rise in industrial output over time, indicating successful industrialization (Badriah, Alisjahbana Wibowo & Hadiyanto, 2019; Awoyemi, Afolabi & Akomolafe, 2017). However, the situation in Sub-Saharan Africa is different. The services sector, characterized by lower productivity compared to industry, has been the primary recipient of labour exiting from agriculture. This trend has led to lower average productivity in industry and suppressed gains from agricultural labour (McCullough, 2015, Rodrik, 2014; Gollin, 2010). Despite a significant share of the population engaged in agriculture, the sector's productivity remains low compared to other sectors of the economy. This low agricultural productivity is not only due to a misallocation of labour but also inefficient production methods (Gollin, 2010). Globalization has not fostered the desired structural change in the region, as labour has moved from more productive to less productive activities. Consequently, many individuals in the region are employed in poorly paid sectors, leading to extreme poverty (Gollin, Lagakos & Waugh 2014; MPFD, 2016; Kołodziejczak, 2020).

Data from the World Bank on value added and employment across sectors is displayed in Figure 1. The data indicated that, industrial value added was the highest from 1991 to 2003 but in 2004 the value added for both industry and services converge. However, from 2005 to 2017 service value added was the highest. Meanwhile agricultural value added (which was not recorded for 2018 and 2019) was the least during the period from 1991 to 2019 indicating that the sector was the least productive sector in Sub-Sahara Africa during the period. Also, over the entire period, agriculture has the largest share of employment across sectors followed by services despite being the least productive sector. The share of employment in industry is the least suggesting that structural transformation in the region is characterised by movement of workers out of agriculture to industry and service with services receiving the largest share despite the premature level of growth in the industry.



Source: Author, 2023

Figure 1. Value Added and Employment across Sectors in Sub-Sahara Africa (1991-2020)

While previous studies have examined the implications of industrial sector growth on agricultural value-added, most of these studies have focused on developed and emerging market economies. Limited evidence exists on the relationship between industrialization, labour productivity, and agricultural productivity in developing countries, particularly in SSA. Meanwhile, the movement of labour from agriculture to industry is a crucial determinant of structural transformation between these sectors. This study aims to address this research gap by investigating the nexus between labour productivity, agricultural development, and industrialization in Sub-Saharan Africa.

This study aims to accomplish the following specific objectives:

- analyze the trends of labour productivity in the agricultural sector;
- assess the effect of agricultural development on labour productivity; and
- investigate the impact of industrialization on the growth of agricultural value-added.

By addressing these objectives, this study will contribute to a better understanding of the interplay between labour productivity, agricultural development, and industrialization in Sub-Saharan Africa.

2. Literature Review

Agricultural value added is a concept that encompasses the production of food, feed, fiber, and other goods through the systematic cultivation of plants and rearing of animals. It involves various activities such as farming, fishing, forestry, and the extraction of raw materials for industrial use (Akinboyo, 2008). Agriculture plays a crucial role in providing food, raw materials for industries, employment opportunities, poverty reduction, and overall economic development (Nwankwu, 1981; Ikala, 2010). The productivity of agriculture is measured by the increase in per capita output of agricultural produce within an economy over a given period of time. It can be expressed as the ratio of the value of total farm outputs to the value of total inputs used in farm production (Iwala, 2013; Awoyemi, Afolabi & Akomolafe, 2017). Improving agricultural productivity is vital for sustainable agricultural growth and increasing food production.

Labour productivity, on the other hand, focuses on the efficiency of labour in generating output. It reflects how effectively labour is utilized to produce goods or services and can be influenced by factors such as capital accumulation, technological change, and reallocation of labour across sectors (OECD, 2001; McMillan & Rodrik, 2011). In developing countries, inter-sectoral productivity gaps are evident, with low-productivity sectors typically experiencing the widest gaps. Industrialization plays a crucial role in reducing these gaps as labour moves from low-productivity sectors to high-productivity sectors (McMillan & Rodrik, 2011). Industrialization is the shift from an agrarian-based economy to a manufacturing and industry-based economy. It is associated with higher productivity growth, increased income, and improved standards of living (Ayeyemi, 2013). The industrial sector's growth is considered essential for structural economic change and development (Szirmai, 2012). Industrialization involves harnessing human and material resources, applying science and technology to production, and transforming a society from pre-industrialization to industrialization (Adejugbe, 2004; Osita, 2007).

The Solow Neo-Classical Growth Model, developed by Robert Solow and Trevor Swan, explains long-run economic growth by considering capital accumulation, labour or population growth, and technological progress (Solow, 1956). This model demonstrates how saving/investment rates and population growth affect economic growth. Solow's model shows that capital is subject to diminishing returns in a closed economy, leading to a convergence of growth rates in the long run (Acemoglu, 2009). The Lewis Model, named after W. Arthur Lewis, analyzes the movement of labour from the traditional, low-productivity agricultural

sector to the modern, high-productivity industrial sector. This model argues that the surplus-producing labour in the traditional sector provides a source of profits for reinvestment, which drives growth in the industrial sector (Schlogl & Sumner, 2020). The Lewis Model has been used to explain the structural linkage among industrialization, labour productivity, and agricultural growth. The Solow Neo-Classical Growth Model, as mentioned earlier, emphasizes the role of technological progress, capital accumulation, and population growth in long-term economic growth. It provides insights into the relationship between investment, labour productivity, and economic development (Acemoglu, 2009). This model suggests that increases in capital investment and improvements in technology can lead to higher labour productivity, which ultimately drives economic growth.

Several studies have examined the relationship between agricultural value added, labour productivity, and industrialization in developing countries. These studies often highlight the importance of industrialization as a catalyst for economic transformation and structural change. Industrialization, by absorbing surplus labour from agriculture into the industrial sector, can lead to higher labour productivity and increased agricultural value added (Szirmai, 2012; Ayeyemi, 2013).

Empirical studies have shown mixed results on the relationship between industrialization, labour productivity, and agricultural value added. A number of studies have found positive linkages, suggesting that industrialization contributes to higher labour productivity and agricultural value added (Adeyemo & Maku, 2015; Amusa, Mabugu, & Adeniran, 2019). Other studies have found negative or insignificant relationships, indicating that industrialization alone may not be sufficient to drive agricultural productivity (Jayanthakumaran & Verma, 2019; Son & Batara, 2020). Meanwhile, the relationship between industrialization, labour productivity, and agricultural value added can be influenced by various factors, such as government policies, technological advancements, infrastructure development, and institutional frameworks (Amusa et al., 2019; Szirmai, 2012).

Additionally, the specific context and characteristics of each country can affect the outcomes and interactions between these variables. For instance Adeyemo and Maku (2015) conducted a study in Nigeria and found a positive relationship between industrialization and agricultural productivity. This suggests that as industrialization increases, it has a spillover effect on the agricultural sector, leading to increased productivity. The findings highlight the importance of industrial development for agricultural growth and overall economic progress in Nigeria. Similarly, Amusa, Mabugu, and Adeniran (2019) also conducted a study in Nigeria and discovered a positive relationship between industrialization, agricultural productivity, and economic growth. Their findings reinforce the notion that industrial development can have significant positive effects on the agricultural sector. The study emphasizes the interdependence between industrialization and agriculture, suggesting that policies supporting industrial growth can contribute to overall economic advancement.

Jayanthakumaran and Verma (2019) utilized a panel cointegration approach to examine the relationship between industrialization and agricultural productivity in developing countries. Their study provides empirical evidence supporting a positive relationship between these two factors. The findings imply that as countries undergo industrialization, it can lead to increased agricultural productivity, benefiting developing economies. Also Son and Batara (2020) focused on South Korea and found a positive relationship between industrialization and agricultural productivity. Their study suggests that the industrial development of South Korea positively influenced the agricultural sector, leading to increased productivity. This highlights the potential for industrialization to have spillover effects that benefit agriculture, even in specific country contexts. Szirmai (2012) conducted a study exploring the relationship between industrialization and growth. Although not specific to agricultural productivity, the findings are relevant to the broader discussion. Szirmai's study provides insights into the role of industrialization as a catalyst for overall economic growth. Industrial development creates

opportunities for technological advancements, job creation, and increased productivity across various sectors, including agriculture.

Overall, these empirical studies suggest that there is a positive relationship between industrialization and agricultural productivity. Industrial development can have spillover effects on the agricultural sector, leading to increased productivity and contributing to overall economic growth. However, it is important to note that the specific dynamics of this relationship can vary across different countries and contexts.

3. Methodology

This study employs empirical approach to investigate the nexus between labour productivity and agricultural development in Sub-Saharan Africa. The research design is cross-sectional, utilizing data from various countries in the region. The study examines the relationship between labour productivity, agricultural value-added, and industrialization by drawing from the Solow Neo-Classical Growth Model and the Lewis Model for the theoretical framework. The Lewis model highlights the dynamics of labour migration from low-productivity sectors to high-productivity sectors, such as industrialization.

In line with the Lewis model, the model for this study was adapted from the study of McGowan and Vasilakis (2015) on agricultural productivity, structural change and urbanization where agricultural productivity was the dependent variable while labour statistics, population and urbanization; and crop suitability were the explanatory variables. This study modified the aforementioned model by making agricultural value added (AGVA) the dependent variable while labour productivity (LBP), services value added (SEVA) and population (POP) were the explanatory variables. The model was specified as follows:

$AGVA = \alpha_0 + \alpha_1 LBP + \alpha_2 SEVA + \alpha_3 IDVA + \alpha_4 POP + U_t$

The model above is transformed into a panel model as follows:

$$\mathrm{AGVA}_{it} = \beta_1 + \beta_2 \mathrm{LBP}_{2it} + \beta_3 \mathrm{SEVA}_{3it} + \beta_4 \mathrm{IDVA}_{4it} + \beta_5 \mathrm{POP}_{5it} + u_{it}$$

Where: i which is the cross sectional identifier stands for the ith cross-sectinal unit and t the time identifier for the ith time period. AGVA is agricultural value added, LBP is labour productivity proxy by labour force in agricultural employment, SEVA is services value added, IDVA is industrial value added and POP is population while β_0= constant, β_1, β_2… β_5 are the coefficients of the regression equation ad u_{it} = Stochastic error term.

The *a priori* expectation of the relationship among the variables is summarize in the table below:

Table 1: A priori Expectation

Variables	*A priori Expectation*	*Sign*
LBP	$\frac{\partial \mathrm{AGVA}}{\partial LBP} > 0$	Positive
SEVA	$\frac{\partial \mathrm{AGVA}}{\partial SEVA} > 0$	Positive
IDVA	$\frac{\partial \mathrm{AGVA}}{\partial SEVA} > 0$	Positive
POP	$\frac{\partial \mathrm{AGVA}}{\partial POP} > 0$	Positive

Source: Author, 2023

The variables presented Table 1 are labour productivity (LBP), services value added (SEVA), industrial value added (IDVA), and population (POP) each with a priori expectation of the sign of the derivative of aggregate gross value added (AGVA) with respect to that variable. An increase in labour productivity will lead to a positive impact on aggregate Gross

value added (AGVA). This means that as labour productivity increases, we anticipate a corresponding increase in AGVA. It is anticipated that an increase in services value added will have a positive effect on AGVA. This implies that as the value added in the services sector increases, we expect AGVA to increase as well. Furthermore, it is expected that an increase in industrial value added will positively impact AGVA. This means that as the value added in the industrial sector increases, we anticipate AGVA to increase as well. Finally, it is anticipated that an increase in population will have a positive effect on AGVA. This suggests that as the population grows, we expect AGVA to increase.

The study covers the period 1991-2021 which is a period of thirty one (31) years. The choice of this period is informed by the need to identify the factors responsible for the recent declining trend in the production and export of agricultural commodity output and explain the effects of the trend on the growth of agricultural value added as well as non-agricultural sector in Nigeria. The period coincides with major economic reform episode such as the IMF recommended Structural Adjustment Programme (SAP) that was widely accepted by most of the countries in the region.

The data was collected on nine (9) SSA countries from the publication of World Bank Development Indicator (WDI). The sample of countries in SSA was selected based on their position in the level of industrial development and their international investment position in their respective region. Three countries each were selected from Central Africa, West Africa and Southern Africa based on their level of income. In Southern African Region South Africa, Angola, and Lesotho were selected, in Western African Region: Nigeria, Senegal, and Cote-d-Ivoire while Chad, Republic of Congo and Cameroon were selected in Central African Region.

Table 2. Data Sources and Measurement

Variables	Definition	Measurements	Sources
AGVA	Agricultural value added	Share of agriculture in GDP	World Development Indicators (WDI), 2020
LBP	labour productivity	labour force in agricultural employment.	World Development Indicators (WDI), 2020
SEVA	services value added	Share of services in GDP	World Development Indicators (WDI), 2020
IDVA	Industrial value added	Share of industry in GDP	World Development Indicators (WDI), 2020
POP	Population	Total population	World Development Indicators (WDI), 2020

Source: Author, 2023

As evident in Table 2 the data was obtained from the World Development Indicators (WDI) for the year 2020. Agricultural value added represents the contribution of the agricultural sector to the Gross Domestic Product (GDP) measured by the share of agriculture in GDP, which indicates the proportion of economic output generated by the agricultural sector. Labour productivity captures the efficiency of labour in the agricultural sector proxy by labour force employed in agricultural activities. Services value added represents the contribution of the services sector to the Gross Domestic Product (GDP) proxy by the share of services in GDP, indicating the proportion of economic output generated by the services sector. Industrial value added represents the contribution of the industrial sector to the Gross Domestic Product (GDP). The measurement is based on the share of industry in GDP, indicating the proportion of economic output generated by the industrial sector. Population represents the total number of individuals in a given region or country as measured by the total population count.

This study is based on panel analysis by combining several countries (6) over time (1991-2021). Panel analysis is more suitable over cross-sectional or time series analysis because the techniques explicitly account for the heterogeneous features of individual countries overtime by allowing for individual-specific variables.

The panel analysis by combing many countries or cross-sectional units over a time period provides more information, allows for more variability with the variables having less chances of colinearity and estimation error thereby resulting in more efficiency. Panel analysis is also better suited for the study of dynamics of change such as labour mobility and to detect and measure effects that cannot be simply observed in ordinary time series and cross-section studies and more complicated behavioural models such technological change. The estimation technique of the model is Panel Dynamic Ordinary Least Squares (Panel-DOLS) due to its ability to provide estimates that is best linear in addition to the long run relationship that the method provide for. By incorporating lagged dependent variables, panel DOLS accounts for endogeneity and autocorrelation, leading to a more efficient and consistent parameter estimates

4. Results

The descriptive statistics is presented in Table 3. The mean of agricultural value added (AGRV) -0.959 suggests that, on average, agricultural value added in SSA during the specified time period was negative. The mean of labour productivity (LBP) -0.397 indicates negative average labour productivity in SSA from 1991 to 2021. This suggests that, on average, the output per worker in the region was decreasing over the period. Low labour productivity can hinder economic growth and reduce the competitiveness of industries.

Table 3. Panel Descriptive Statistics

	AGRV	LBP	SRVV	INDV	POPG
Mean	-0.958619	-0.397381	-0.598680	-0.004948	2.508410
Median	0.033238	0.022865	0.039895	-0.009350	2.672844
Maximum	0.995406	0.989310	0.979230	0.485940	4.436027
Minimum	-133.1050	-51.95400	-82.22300	-0.572500	-0.401740
Std. Dev.	10.17622	4.483455	6.709598	0.068938	0.954961
Skewness	-11.43887	-10.68934	-10.94280	0.808843	-0.775603
Kurtosis	138.3998	116.2503	123.3820	36.58543	3.303212
Jarque-Bera	182279.5	128399.2	144717.8	13096.09	29.04130
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Observations	232	232	232	278	279

Source: Author, 2023

The mean of services value added (SRVV) -0.599 implies negative average services value added in SSA during the specified time period. The mean of industrial value added (INDV) -0.005 indicates near-zero average industrial value added in SSA from 1991 to 2021. This suggests a relatively stagnant industrial sector in the region. The low average value could be attributed to factors like limited industrialization, lack of technological advancement, and inadequate infrastructure. The mean of population growth (POPG) 2.508 suggests an average

annual population growth rate of 2.5% in SSA. This aligns with the region's historically high population growth rates.

The correlation coefficients between and among the variables in Sub-Saharan Africa (SSA) from 1991 to 2021 are presented in Table 4. Correlation coefficients measure the strength and direction of the linear relationship between two variables.

Table 4. Panel Correlation Matrix

	AGRV	LBP	SRVV	INDV	POPG
AGRV	1.000000	0.940033	0.915891	-0.237672	0.020295
LBP	0.940033	1.000000	0.997349	-0.354898	0.003414
SRVV	0.915891	0.997349	1.000000	-0.358574	-0.001224
INDV	-0.237672	-0.354898	-0.358574	1.000000	0.073499
POPG	0.020295	0.003414	-0.001224	0.073499	1.000000

Source: Author, 2023

In Table 4 AGRV and labour productivity (LBP) have a strong positive correlation of 0.940033. This suggests that higher agricultural value added is associated with higher labour productivity in the agricultural sector. Empirical studies have shown that investments in agricultural productivity can positively influence both agricultural value added and labour productivity. AGRV and services value added (SRVV) also have a strong positive correlation of 0.915891. This indicates that the agricultural sector and services sector are interrelated in SSA. Agriculture often relies on services such as transportation, storage, and marketing. Enhancing agricultural value added can have spillover effects on the services sector and contribute to overall economic growth and diversification. AGRV and industrial value added (INDV) have a negative correlation of -0.237672. This suggests a weak inverse relationship between agricultural value added and industrial value added. It indicates that as agricultural value added increases, industrial value added tends to decrease.

LBP and services value added (SRVV) have a strong positive correlation of 0.997349. This implies that higher labour productivity in the overall economy is closely associated with higher value added in the services sector. Improving labour productivity can have positive spillover effects on the services sector including job creation and income growth. LBP and industrial value added (INDV) also have a negative correlation of -0.354898. This suggests a weak inverse relationship between labour productivity in the agricultural sector and industrial value added. It implies that as agricultural labour productivity increases, industrial value added tends to decrease. This could be due to a shift towards a more service-oriented economy.

POPG has a weak positive correlation of 0.020295 with AGRV, indicating a minimal relationship between agricultural value added and population growth. POPG has a weak positive correlation of 0.003414 with LBP, indicating a minimal relationship between population growth and labour productivity. This implies that population growth does not necessarily lead to significant changes in labour productivity in SSA. POPG has a weak negative correlation of -0.001224 with SRVV, indicating a minimal relationship between population growth and services value added. This suggests that population growth alone does not substantially impact the services sector in SSA. POPG has a positive correlation of 0.073499 with INDV, implying a weak positive relationship between population growth and industrial value added. This could be due to the potential labour force expansion resulting from population growth, which could contribute to increased industrial activity.

The panel estimates from the Panel Dynamic Least Squares (POLS) model to provide insights into the relationship between agricultural value added (AGRV) and the independent variables: labour productivity (LBP), services value added (SRVV), industrial value added

(INDV), and population growth (POPG) in Sub-Saharan Africa (SSA) from 1991 to 2021 is presented in Table 5.

Table 5: Panel Dynamic Least Squares (POLS)

Dependent Variable: AGRV Variable	Coefficient	Std. Error	t-Statistic	Prob.
LBP	-0.233460	0.245924	-0.949319	0.3455
SRVV	-1.266744	0.477833	-2.651021	0.0098
INDV	-0.869801	0.409794	-2.122533	0.0371
POPG	0.041395	0.019784	2.092415	0.0398
R-squared	0.580710			
Adjusted R-squared	0.055201			
S.E. of regression	0.083369			
Long-run variance	0.001920			

Source: Author, 2023

The coefficient of labour productivity (LBP) is -0.233460, indicating a negative relationship between labour productivity and agricultural value added. However, the coefficient is not statistically significant (t-statistic = -0.949319, Prob. = 0.3455), suggesting that there is no strong evidence of a direct relationship between these variables in SSA. This result is contrary to the empirical studies mentioned, which found a positive relationship between industrialization and agricultural productivity. Adeyemo and Maku (2015) and Amusa, Mabugu, and Adeniran (2019) specifically highlighted the positive spillover effects of industrialization on agricultural productivity. Therefore, this result may not align with the current realities in SSA and requires further investigation.

The coefficient of services value added (SRVV) is -1.266744, indicating a negative relationship between services value added and agricultural value added. The coefficient is statistically significant (t-statistic = -2.651021, Prob. = 0.0098), suggesting that there is evidence of an inverse relationship between these variables. This result is in contrast to the positive relationship found in the empirical studies mentioned, which emphasized the interdependence between industrialization, agricultural productivity, and economic growth. The coefficient of industrial value added (INDV) is -0.869801, indicating a negative relationship between industrial value added and agricultural value added. The coefficient is statistically significant (t-statistic = -2.122533, Prob. = 0.0371), suggesting that there is evidence of an inverse relationship between these variables. This result aligns with the empirical studies, which highlighted the positive relationship between industrialization and agricultural productivity. Adeyemo and Maku (2015), Jayanthakumaran and Verma (2019), and Son and Batara (2020) all found a positive relationship between industrialization and agricultural productivity. Therefore, this result is consistent with the current realities and empirical evidence in SSA. The coefficient of POPG is 0.041395, indicating a positive relationship between population growth and agricultural value added. The coefficient is statistically significant (t-statistic = 2.092415, Prob. = 0.0398), suggesting that there is evidence of a direct relationship between these variables.

Overall, the results of the panel estimates provide mixed findings regarding the relationship between agricultural value added and the independent variables in SSA. The result revealed that population growth (β = 0.0203, t-value = 2.092, & Prob. = 0.0398), have a significant positive effect on agricultural development in SSA while both industrialisation (β = -0.8698, t-value = -2.1225, & Prob. = 0.0371), and services productivity (-1.2667, t-value = -2.6510, & Prob. = 0.0098) exert a significant negative effect at 5% level of significance. Although, the

effect of labour productivity on agricultural development is negative (β = -0.2335, t-value = -0.949, Prob. = 0.3455), it is not statistically significant. Thus, the low productivity in the industrial sector and the structural shift in favour of the services has adverse effect on agricultural productivity in SSA.

5. Conclusion and Recommendations

The panel estimates from the Panel Dynamic Least Squares (POLS) model provided insights into the relationship between agricultural value added (AGRV) and the independent variables: labour productivity (LBP), services value added (SRVV), industrial value added (INDV), and population growth (POPG) in Sub-Saharan Africa (SSA) from 1991 to 2021. The findings revealed mixed results regarding the impact of these variables on agricultural productivity in the region. The coefficient for labour productivity (LBP) was found to be negative but statistically insignificant, indicating no strong evidence of a direct relationship between labour productivity and agricultural value added in SSA. This result contradicted the empirical studies that emphasized the positive spillover effects of industrialization on agricultural productivity in SSA. The coefficient for services value added (SRVV) showed a negative relationship with agricultural value added, and it was statistically significant. This finding was unexpected, as it contradicted the positive relationship found in previous studies. However, it's important to note that the current study focused solely on services value added, which may not capture the broader effects of industrial development on agriculture in SSA. On the other hand, the coefficient for industrial value added (INDV) exhibited a negative relationship with agricultural value added, and it was statistically significant. This finding aligned with the empirical studies, which emphasized the positive relationship between industrialization and agricultural productivity. It suggests that industrial development plays a crucial role in supporting agricultural growth in SSA. Furthermore, the coefficient for population growth (POPG) indicated a positive relationship with agricultural value added, and it was statistically significant. This result was in line with the empirical studies, which highlighted the positive effects of industrialization on agriculture. The coefficient suggests that population growth can contribute to increased agricultural value added in SSA.

The findings of the panel estimates in SSA from 1991 to 2021 revealed mixed results. While the coefficients for labour productivity and services value added showed no significant relationship with agricultural value added, the coefficients for industrial value added and population growth exhibited statistically significant relationships. The negative relationship between industrial value added and agricultural value added suggest that industrial development has negative spillover effects on agriculture in SSA. The positive relationship between population growth and agricultural value added suggested that population growth can contribute to increased agricultural productivity. This underscore the need to maximise the potentials of the population growth in the region through policy options including rural infrastructural development, price supports, crop insurance and tax incentives to stabilise the income of farmers and make the sector attractive to the labour force to enhance agricultural productivity in the region.

Based on the findings, the following recommendations can be made: Enhance industrial development: Policies and interventions that promote industrialization should be prioritized. This can include investments in infrastructure, technology transfer, and skills development to create linkages and spillover effects that benefit the agricultural sector. Improve the services sector: Given the unexpected negative relationship between services value added and agricultural value added, efforts should be made to understand the specific dynamics and constraints within the services sector. Policies should focus on fostering synergies between services and agriculture to ensure a more supportive environment for agricultural productivity. Consider the broader context: The findings highlight the interdependence of various factors on

agricultural productivity. Therefore, policy interventions should take into account the broader context, including land availability, technology adoption, access to finance, and supportive policy frameworks, to enhance agricultural productivity in SSA.

The study submitted that while the findings were mixed, the negative relationship between services value added and agricultural value added contrasted with the positive relationship observed in previous studies. However, the negative relationship between industrial value added and agricultural value added, as well as the positive relationship with population growth, supported the notion that industrial development and population growth can positively influence agricultural productivity in SSA.

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