

Global Value Chain Participation and the Performance of the Agriculture Sector in Africa

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Abstract

Agriculture remains a relevant and indispensable sector in growing Africa economies, yet many African economies continue to benefit poorly from cross border trade in agricultural products. This paper investigates the effects of the two types of GVC participation (forward and backward participation) on three indicators of agriculture performance (agriculture value added, agricultural export and prices of agricultural products) in African economies. Using panel data from four sources (UNCTAD-EORA-WIOD, WDI, FAOSTAT and the Penn World tables), this paper applies the feasible generalised least square (FGLS) technique on three independent linear specifications. The results reveal that (i) forward and backward participation in global value chain have a positive and significant effect on agriculture value added in African economies, (ii) forward participation has a negative and significant effect on agriculture exports while backward participation has a positive and significant effect on the agriculture export in Africa, (iii) forward participation has a negative effect on prices of agricultural product while backward participation, has a positive and significant effect on the prices of agricultural products in African economies. This paper recommends that for a GVC development strategy, African economies should develop value chain activities inclined towards backward participation in global value chain. The policy implication is that more value will be added to intermediate goods in the agricultural sector thus triggering a transformational change in agriculture, which will lead to more economic benefits in terms of enhanced productivity as well as greater sophistication and diversification of exports.

Keywords: Global Value Chain, Forward & Backward participation, agriculture sector performance, Africa

INTRODUCTION

Agriculture is an indispensable sector in many developing countries having a significant proportion of their population engaged in activities related to agriculture. ECLAC (2021) reveal that a large proportion of the world's less privileged population lives in rural regions and work in agriculture or its upstream and downstream sectors. Rural poverty has increased by 6 million (ECLAC, 2021). Agriculture is the crucial source of income in low income developing countries especially those in Africa. An improvement in the agricultural sector will likely improve wealth and wellbeing and economic growth in these countries. Contrarily, when the agricultural faces difficulties, it may negatively affect other economic outcomes in these countries (DaniloB- et al. 2018). Earlier, the World Bank (2007) asserts that ,in agriculture-based economies, agriculture generates on the average 29% of the Gross Domestic Product (GDP) and employs 65% of the labour force. In the context of globalization, agriculture becomes an important tool or channel through which less privileged growing economies can ameliorate their seemingly persistent low level of development. This growth opportunity passes through a wide range of poverty reduction which is frequently a common outcome of participating in various agricultural production chains. This has made agriculture to be a major call for concern in social sciences. The implication of the social science and economics to the field of agriculture has been highlighted by Martin (1978)in the domain of agricultural economics.

The relevance of agriculture in growing economies is also due to its multifunctional role and the fields of study covered including production and farm management, food and consumer economics, and many fields of development economics (DaniloB-et al. 2018).With this, global agricultural markets are increasingly becoming complex because it embodies crude output, value added intermediate products and processed final products, all sold at varied prices. The potential benefits of agriculture can be captured at the level of agriculture export, agriculture value added and prices of agricultural product. Analysing the trends of these variables in the global economy is the core of this paper. A country's participation in global activities stands to affect these variables.

The literature, however, makes analyses focusing on structural transformation of economies attributing agriculture to least developed economies and other complementary sectors (industry and services sectors) to high-income countries. The structural transformation of an economy can be achieved by participating in agricultural global value chains with some countries moving from the agricultural sector directly to the service sector (Lim, 2019). In developing African countries where agriculture is a pivotal economic activity due to their natural endowments, other sectors are regarded as complementary to the agricultural sector. This is easily understood when the industry and the service sectors complement the agricultural sector in what is now referred to as chain activities characterised by value addition.

Kaplan et al (2016) in an agricultural value chains evaluation emphasised that Value Chain promotion or development is an appropriate approach for improving the living conditions of people in rural areas. The

emergence of GVCs calls for a reassessment of a wide range of analyses, and the extent to which countries, including emerging or developing economies, benefit from participation in global value chains. The myopic conception of limiting agriculture to farm production becomes obsolete giving room for the development of agribusinesses. This concept becomes more interesting when it takes place on a global scale. Global value chains have changed production and specialization patterns in the agricultural and food sectors leading to an increase in exchanges based on high valued processed products (Taglioni and Winkler, 2016). Small countries can therefore participate in such global production network and gain from bigger nations (Minten et al., 2009; Cattaneo et al., 2013; Swinnen and Kuijpers, 2017). The agriculture sector has an important role to play in some stages of the global value chain in the supply of raw materials used in other production sectors (Greenville et al., 2017). This has led to an increasing importance of trade in agricultural products at a global scale. This is confirmed by the fact that global food supply occur in a network of chain actors located all over the world covering both developed and developing countries (Gereffi and Lee, 2012). Some primary products are perishable but with value addition processes improve their durability coupled with a resulting high value product (Onwunmere et al 2014). GVC participation is driven not only by the product characteristics, but also by the country's economic environment. Furthermore, trade in intermediate inputs generate multiple level benefits to countries involved (Tajoli and Felice, 2018). The development of agriculture value chains is becoming important nowadays because studies have shown that it increases rural income, reduce rural poverty and accelerates pro-poor growth (Rao et al,2012; Rao and Qaim, 2011; Reardon et al., 2009).

GVCs highly encourage the transformations of developing economies, with the agriculture and food sectors being at the fore front and many subsistence economies moving to commercialized, more productive agricultural activities under the canopy of agribusinesses (Greenville et al., 2017; Del Prete et al., 2017; Montalbano et al., 2018). Also, GVC participation is an appropriate channel through which knowledge, capital, and other inputs flow (IMF 2015)

Empirical evidence reveals that Africa's participation in GVC is dominated by low value added stages of the chains including predominantly the agricultural sector (Foster-McGregor et al., 2015). Neo-classical Trade Theory posits that international trade improves resource allocation, lowers prices of goods and services to consumers, leading to a more efficient production. To ease cross border trade, international organizations have been advocating for trade liberalization which can speed up growth processes in developing countries (Montalbano, 2011). Free trade will thus fasten the integration of different economies into the global system (Badinger, 2008). Cross border trade and production is increasingly being dominated by global value chains (Ignatenko et al., 2019). An outstanding phenomenon as time evolves is the modification of international trade and cross border transactions from trade in goods to trade in tasks (Grossman and Rossi-Hansberg, 2008).

Rashmi, (2013) measures the participation of different countries in GVC and concluded that countries can gainfully link into GVCs in specific industries where the country is able to generate net positive domestic value-added gains. The relevance of GVC participation in the agricultural sector has been on a constant increase in Africa, though highly dominated by upstream activities oriented towards European markets (Foster-McGregor et al., 2015; Balié et al., 2019). African firms perform better as they integrate into internationally fragmented production networks. GVC participation is therefore considered a key driver for Africa's structural transformation. This is because it stimulates investments in infrastructure, skills, capital, sophisticated inputs and flows of knowledge which are all catalysts to local production with high possibilities of assuring structural transformation, income growth and economic development (Del Prete, et al. 2016)

Despite these potential benefits, the economic literature did not have the chance until recently to: 1) quantitatively assess the participation and integration of SSA countries in the agriculture and food GVCs and – consequently – 2) formulate any evidence-based policy recommendations on how to increase this participation. In the first case, the lack of reliable measures raises concerns because the conventional trade statistics based on gross export flows are unable to capture the increasing role of vertical integration and product fragmentation.

The degree of governance and power along global value chain differ in developed and developing economies. A long-standing international debate about the multiple challenges of governance along GVC is now growing intense. However, focussing on the overall trends of developed and developing economies may be misleading or may tend to divert attention. Developing economies often reap lower than bigger more advanced nations who have firms with high market power (Greenville et al, 2017). This paper investigates the possible causes of low harvest of developing economies in global interactions and proposes basic remedies. Most studies on agriculture GVCs are highly inclined towards products to assess the impact on national economies (Salvatici and Nenci, 2017). This paper has as objective to investigate the effect of GVC participation on agriculture value added, agricultural export and prices of agricultural products in African economies. Foreign and domestic values added are both important for the performance of an economy depending on the prevailing level of technology. It becomes imperative therefore to identify which of them have a stronger impact on agriculture output, agriculture export and prices of agricultural products

THEORETICAL FOUNDATION AND EMPIRICAL LITERATURE

Theoretical Foundation

Early theorists contemplated on sources or determinants of value addition, which could be targeted by policy makers to influence macroeconomics aggregates. These theories expatiated around the production and the circulation of commodities. Founders of political economics like William Petty (1623 - 1687), David Ricardo (1772 - 1823) and Adam Smith (1723-1790) emphasised on labour as a major source of value (Backhaus, 2012). Quesnay and other French writers of the 1750s and 1760s under what was popularly known as physiocracy, were the first economists to begin to analyse production rather than simply circulation and identified agricultural labour as the true productive source of value. They believed however that only agricultural labour was truly productive (Backhaus, 2012). Other theorists like John Stuart Mill (1806 - 1873) focused on concepts like value in use and value in exchange, making a clear allusion of price as another indicator of value. Mill in 1848 rejects the labour theory of value and brought forth the appellation of value to be the proper price related to the cost of production. Marginalists like William Stanley Jevons (1835 - 1882), Léon Walras (1834 - 1910), and Karl Menger (1871) followed the marginal utility theory of value viewing "value" as something objective in relation to both producer and consumer. (Backhaus, 2012)

In agricultural production or output, theories like the resource exploitation model suggest that increase in agricultural production occurs as a result of the expansion in area cultivated. Here, surplus capacity in land and labour expands the production of peasant producers under the stimulus of new markets no matter the level of technology. Also, the conservation model developed, during the English agricultural revolution of 18th century and supported by English economists like Malthus, David Ricardo and John Stuart Mill, assume that land for agricultural production is increasingly scarce and that soil exhaustion is possible. To them, actions to increase land productivity will be slow. As land scarcity increase, poorer land is used, causing the marginal productivity of labour and of land to decline. To prevent this, priority should be given to maintaining soil productivity at its present level by integrating crop production and livestock rearing (Backhaus, 2012). Another theory under the location model was formulated to explain geographic variations in the location and intensity of agricultural production in an industrializing economy. It states that agricultural countries or places located closer to the market or urban areas are characterized by higher product prices, land values, and rates of land use of land use. The diffusion model on its part suggests that better husbandry practices and of crop and livestock varieties has been a major source of productivity in agriculture. The route to agricultural development is, through more effective dissemination of technical knowledge and a narrowing of dispersion in productivity among individual farmers and among regions. The high-pay off input model focuses on how to create and provide to farmers the new, higher-payoff technology embodied in capital equipment and other inputs and how to increase the productivity of labour. The model posits that, "economic growth from the agricultural sector of a poor country depends predominantly upon the availability and price of modern high-pay off inputs" (Backhaus, 2012).

The fragmentation theory has been very relevant in recent agricultural practices with varied climate, fertility, technology and technical know-how. Kimura (2006) asserts that the mechanism adopted by fast emerging East Asia countries follows the "fragmentation theory", proposed by Jones and Kierzkowski (1990, 2005), which states that the fragmentation of the production processes depends on the differences in location advantages. These advantages based on location are considered based on variation in factor prices in different regions coupled with the levels of technology and the cost of linking the fragmented units.

Empirical Literature

A few studies published findings on the role of intermediate goods on total factor productivity and found that exchange in intermediate goods have a positive effect on the output of some industries (Bas and Strauss-Kahn, 2014; Halpern et al., 2015; Olper et al., 2015). Bencharif and Rastoin, (2007) analysed agribusiness global value chain of wheat over a period of 42 years (1963-2005). This analysis highlights the disintegration of global value chain. They found that for the past three decades, there has been a slow decline in the production and distribution sector. Consumers gain in terms of product diversity, but the economic benefits of the sector is not certain because of information and management deficit. Here, the global value chain seems highly vulnerable due to a strong external dependency.

Miroudot and Koen (2012), under the canopy of the OECD presented a report on mapping global value chain. Their main objective is to look for better evidence which help to examine the position of countries within international production network. Here, detail assessment of global value chain of six broad industries was done (agriculture and food production, chemicals, electrical and computing machinery, motor vehicle, business services, and financial service). The study uses a model of trade and production that links internationally input-output tables from 58 countries (one of these countries being the "rest of the world"). Results from the section on agriculture, using data on the length, participation and distance to final demand confirms the fact that food products are globally produced in the value chain in situations where developing and developed countries are involved. Another study conducted by the Organisation for Economic Co-operation and Development (OECD) in 2016 on GVC participation in the agriculture and food sectors focuses on the flow of products across national borders within GVCs. They make use of a newly developed

database on trade in value added and focused on 18 agro-food sectors and discovered that across the 18 sectors, GVC participation varies considerably based on the nature of the product produced

Montalbano, P. and Nenci, S. 2020 examined the measures of GVCs participation and positioning developed by EORA data and assessed their effects on agriculture value added. Their results reveal that changes in GVC participation are positively associated with changes in agriculture value added, further, mixed results are found on the effects of countries' positioning along the value chain. Also, this work identifies tariff barriers, non-tariff barriers and barriers to service trade as the main obstacles to GVC participation and consequent, domestic value added.

Based on agricultural commodities exports and imports growth, David (2003) found that most agricultural commodities have inelastic demand leading to lower world prices and lower export earnings for developing countries. Also, agricultural export instability is more visible in developing countries than in more advanced economies with more negative effects on macro outcomes (Glezakos, 1973; Chaudhary and Qaisrani, 2002). UNCTAD (2009) conducted some findings in India and concluded that Indian exports are very sensitive to world income changes and a fall in world GDP leads to a drop in export. Another study by Upender (2007) found that this relationship exist both in the short run and the long run.

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Methodology and Data

This paper seeks to investigate the effect of the two types of global value chain participation on three different indicators of agriculture performance (agriculture value added agriculture export and prices of agricultural) in African economies. The two types of global value chain participation ties with chain activities in agriculture.

Using the global Input-Output tables, with information on the various entries, it is now possible to compute more properly the implied upstreamness or down streamness of specific industries and countries (Fally, 2012; Antràs et al., 2012; Antràs and Chor, 2013; Alfaro et al., 2019; Miller and Temurshoev, 2017; Wang et al., 2017). The main idea here is to know whether the output of a country or industry is destined to final consumers worldwide or are intermediate inputs to be used by other producers in the world. Agriculture displays these two principal value addition pathways; the first being the processing pathway involving domestic value addition with GVCs occurring through downstream processing sectors (backward participation). The next being the primary pathway, where domestic value addition is centred on raw material and the gains on GVCs are by exporting these primary products (forward participation).

Indicators have therefore been developed using intercountry input output tables to determine trade in value added (Salvatici and Nenci, 2017). These aggregate analyses show that agriculture is not exempted from global exchange and usage of intermediate products for global production (OECD, 2016). These two forms of GVC participation is in line with those used by, Ningaye et al (2021), Kenfack et al (2020) and Gilhaimé and Jiong (2019), Tinta, (2017). The two forms of participation are forward participation captured by domestic value added and backward participation captured by foreign value added.

The data used in this paper emanates from four sources; UNCTAD-EORA-WIOD database, WDI, FAOSTAT and the Penn World tables. The table below gives more detail on the variables used and their sources.

Table 1: Summary of Variables used in the Model, Measure and Source

Variables	Measure (Abbreviation)	Source
Agriculture Value Added	Agriculture value added (AVA)	WDI-2018
Agriculture Export	Agricultural export value (AEXP)	FAOSTAT
Prices of agricultural products(PAP)	Producer Price Index	FAOSTAT
Forward participation(dva)	Domestic value added (DVA)	EORA, WIOD
Backward participation(fva)	Forward value added (FVA)	EORA, WIOD
Service sector	Service value added (SVA)	WDI-2018
Manufacturing sector	Manufacturing value added (MVA)	WDI-2018
Human capital	Human capital index (HCI)	Penn World Table
Level of development	GDP per capita growth (GDPpcg)	WDI-2018
Credit facilities	Domestic credit to private sector (DCPS)	WDI-2018
Energy usage	Access to electricity (AE)	WDI-2018
Labour	Labour force total (LFT)	WDI-2018
Unemployment	Unemployment rate (UR)	WDI-2018
Transport services	Transport services as percentage of export services (TS)	WDI-2018
Capital	Gross capital formation (GCF)	WDI-2018
Foreign direct investment	Foreign direct investment, net inflows(FDI) (% of GDP)	WDI-2018

Source: Authors' Construction

The yearly macro data varies from 2000 to 2018 principally because 2019 which followed was characterised by the COVID 19 pandemic which highly influenced cross border interactions. This paper covers the entire African continent but only 33 of these countries are considered in our regressions due to the absence of data in some countries. Countries included in the sample are Algeria, Angola, Botswana, Burundi, Cameroon, Cote D'Ivoire, Democratic Republic of Congo, Egypt, Gabon, Gambia, Ghana, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria Rwanda, Senegal, Sierra Leon, South Africa, Tanzania, Togo, Tunisia, Uganda, Lesotho, and Seychelles.

Control variables are selected based on previous studies.

Model specification

The following three equations are specified in line with the objective of this paper.

- To investigate the effect of the two types of global value chain participation and other controlled variables on agriculture value added, a panel specification is made as follows.

$$AVA_{it} = \beta_0 + \beta_n * X_{it} + \varepsilon_{it} \dots \dots \dots (1)$$

Where

AVA_(it) is Agriculture Value Added of country i at time t, X_{it} is a set of explanatory variable of country i at time t, β₀ is the constant term, β_n represent the different coefficients to be estimated associated to each explanatory variable, ε_{it} is the error term.

- To assess the effect of the two types of global value chain participation and other control variables on agriculture export, another specification is made as seen below.

$$AEXP_{it} = \alpha_0 + \alpha_n * X_{it} + \varepsilon_{it} \dots \dots \dots (2)$$

Where

AEXP_(it) is the agriculture export of country i at time t, X_{it} is a set of explanatory variable of country i at time t, α₀ is the constant term, α_n is a set of coefficients to be estimated associated to each explanatory variable and ε_{it} is the error term.

- To assess the effect of the two types of global value chain participation and other control variables on prices of agricultural product, another specification is made as follows.

$$PAP_{it} = \gamma_0 + \gamma_n * X_{it} + \varepsilon_{it} \dots \dots \dots (3)$$

PAP_(it) is the price of agricultural products of country i at time t, X_{it} is a set of explanatory variable of country i at time t, γ₀ is the constant term, γ_n is a set of coefficients to be estimated associated to each explanatory variable and ε_{it} is the error term.

Table 2: Panel unit root tests

Variables	Common unit root process			Individual unit root process		
	Levin-Lin-Chu unit-root test			Im-Pesaran-Shin unit-root test		
	statistics	Prob.	Decision	statistics	Prob.	Decision
Agriculture Value Added (AVA)	-4.8806	0.0000	I(0)	-5.5752	0.0000	I(0)
Agriculture Export (AEXP)	-9.8873	0.0000	I(1)	-10.6068	0.0000	I(1)
Prices of agricultural products(PAP)	-6.2885	0.0000	I(1)	-9.8400	0.0000	I(2)
Forward participation(dva)	-4.1537	0.0000	I(0)	-6.7503	0.0000	I(0)
Backward participation(fva)	-4.1654	0.0000	I(0)	-5.3862	0.0000	I(1)
Service value added (SVA)	-9.9699	0.0000	I(0)	-11.7062	0.0000	I(1)
Manufacturing value added (MVA)	-2.7754	0.0028	I(0)	-5.6340	0.0210	I(0)
Human capital index (HCI)	-2.4493	0.0072	I(1)	-4.005	0.0000	I(0)
GDP per capita growth	-6.9401	0.0000	I(0)	-5.54422	0.0000	I(0)
Domestic credit to private sector (DCPS)	-2.0222	0.0216	I(0)	-3.5488	0.0030	I(1)
Access to electricity (AE)	-7.6092	0.0000	I(1)	-9.7890	0.0001	I(2)
Labour force total (LFT)	-7.2470	0.0000	I(2)	-8.6543	0.0000	I(2)
Unemployment rate (UR)	-6.1617	0.0000	I(0)	-12.6586	0.0000	I(1)
Transport services (TS)	-11.7318	0.0000	I(1)	-4.7356	0.0000	I(0)
Gross capital formation (GCF)	-3.7996	0.0001	I(0)	-6.6231	0.0000	I(1)
Foreign direct investment	-4.9012	0.0000	I(0)	-4.6706	0.0000	I(0)

Source: Authors' calculation with STATA 14

The result of the two panel unit root tests in table 2 above shows that, a good number of variables used are stationary at level or at first difference except for the variables price of agricultural products, access to electricity and labour force total which become stationary at second difference.

This study makes use of the feasible generalized least squares (FGLS) technique to estimate the coefficients of a multiple linear regression model specified above. This technique resolves many biased problems associated with panel linear specification.

PRESENTATION OF RESULTS AND DISCUSSIONS

The regressions conducted on equations (1), (2) and (3) above; give rise to results presented in Tables 3a, 3b and 3c below and immediately interpreted and discussed.

Table 3a: The Effect of Global Value Chain Participation on Agriculture Value Added

Independent variables	Dependent variable : Agriculture Value Added (AVA)		
	(1)	(2)	(3)
Forward participation	3.20009 *** (5.55008)		1.32707 *** (4.038908)
Backward participation	3.04007*** (1.13089)	3.370007*** (8.520008)	
Service value added	-.5441801*** (.0235658)	-.5446079*** (.0231593)	-.527848 *** (.0222777)
Manufacturing value added	-.2624867*** (.0283431)	-.2519405*** (.0239204)	-.279192*** (.0238037)
Human capital index	-3.894562 *** (.6319647)	-3.638327*** (.6283782)	-3.222489*** (.6183401)
GDP per capita growth	-.0567703 (.0536408)	-.0551873 (.0540411)	-.0588708 (.0511648)
Domestic credit to private sector	.0041323 (.002629)	.0041644 (.0026816)	.0056371** (.0027896)
Access to electricity	-.1024244*** (.0074428)	-.1050306*** (.0074022)	-.10683*** (.0070268)
Labour force total	9.97009 (1.84008)	1.154508 (1.864008)	2.41108 (1.69008)
Unemployment rate	-.5694018*** (.0275728)	-.5708959*** (.0269941)	-.5582205*** (.0233622)
Transport services	.0375698 (.0128805)	.0372184*** (.0129272)	.0387433*** (.0123449)
Gross capital formation	-.2589919*** (.0229991)	-.2577153*** (.0225735)	-.2719991*** (.0223928)
Foreign direct investment	.0752094** (.03859)	.075049** (.0386265)	.0566941 (.0377946)
Constant	70.94484 *** (1.33877)	70.4192 *** (1.332018)	69.43503 *** (1.256258)
Observations	627	627	627
Number of countries	33	33	33

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Source: Authors' Calculation with STATA 14

Table 3a above presents the coefficients of the regression model to find out the effect of the two types of global value chain participation and other control variables on agriculture value added. With regard to the target variables both forward and backward participation have a positive and significant effect on agriculture value added in all regressions. This means that an increase in backward or forward participation leads to an increase in agriculture value added in African economies. Concerning other control variables, eight of these variables are statistically significant. Six of these variables (Service value added, Manufacturing value added, human capital index, access to electricity, unemployment rate, gross capital formation) affect agriculture value added negatively while the remaining two (transport services and foreign direct investment) affect it positively.

Table 3b: The Effect of Global Value Chain Participation on Agriculture Export

Independent variables	Dependent variable : Agriculture Export		
	(1)	(2)	(3)
Forward participation	-.0309147 *** (.0023271)		-.0082934 ** (.0034737)
Backward participation	.265801*** (.0151359)	.1999783*** (.0139386)	
Service value added	703.5959 (1759.653)	2729.655 (1875.154)	3147.428 (2209.742)
Manufacturing value added	4813.992*** (1241.452)	1850.378 (1670.618)	.735.722 (2236.836)
Human capital index	137520.6*** (39901.96)	.194682 *** (44023.07)	245180.9*** (57862.09)
GDP per capita growth	-1381.935 (3905.268)	2281.873 *** (.4586.177)	605.6721 (5803.226)
Domestic credit to private sector	-.107.2072 (122.1638)	94.95541 (171.1697)	670.083 * (360.806)
Access to electricity	1863.275*** (653.1222)	1539.191** (685.0087)	5576.118*** (831.2967)
Labour force total	.0136161*** (.0020112)	.0131574*** (.0021491)	.0285511*** (.0028805)
Unemployment rate	-13431.26*** (1920.908)	-12002.85*** (2207.982)	-5822.674** (2892.483)
Transport services	-779.0448 (1106.37)	1017.097 (1187.603)	-39.25695 (1360.479)
Gross capital formation	-5625.325*** (1783.422)	-10421.9*** (2017.127)	-7633.506*** (2693.961)
Foreign direct investment	3900.278 (2903.301)	9871.224*** (3446.898)	7174.284* (4296.414)
Constant	90233.28 (103869.1)	-48659.44 (110011.4)	-409080.9 (124289.6)
Observations	627	627	627
Number of countries	33	33	33

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculation with STATA 14

In Table 3b above the result of the coefficients of the regression model to find out the effect of the two types of global value chain participation and other control variables on agriculture export are presented.

The results displayed by the two target variables are all significant with different signs. The variable forward participation has a negative effect on agriculture exports in all regressions. This means that an increase forward participation leads to a fall in agriculture export in African economies. Backward participation on the other hand has a positive and significant effect on the agriculture export of African economies. This means that, if African countries increase backward participation, it will increase the exportation of agricultural product. Three control variables (human capital index, access to electricity and labour force total) have a positive and significant effect on agriculture export. Two other control variables (unemployment rate and gross capital formation) have a negative effect on agriculture export.

Table 3c: The Effect of Global Value Chain Participation on Prices of Agricultural Products

Independent variables	Dependent variable : Prices of Agricultural Products		
	(1)	(2)	(3)
Forward participation(dva)	-6.3300908 (2.627707)		-6.640007 *** (2.104507)
Backward participation(fva)	5.540006*** 9.797807	5.840006*** (7.988707)	
Service value added	-.1154632 (.2136093)	-.3059869 (.2065618)	-.0769641 (.2062225)
Manufacturing value added	-1.269492*** (.2511509)	-1.274187*** (.2261863)	-1.295454*** (.2333642)
Human capital index	77.72307*** (7.261831)	80.17944*** (7.046821)	.81.8127*** (7.221326)
GDP per capita growth	-.1843047 (.5326996)	-.131881 (.4855074)	-.0551441 (.5046354)
Domestic credit to private sector	-.3017826*** (.0983631)	-.3389133*** (.0905191)	-.0044936 (.0804817)
Access to electricity	.0275576 (.0909029)	-.0123799 (.0860861)	-.0314585 (.0889543)
Labour force total	-1.200006*** (1.984507)	-1.280006*** (1.840007)	-9.552307*** (1.879807)
Unemployment rate	-2.799558*** (.2545489)	-2.870715*** (.2404097)	-2.777053*** (.2544513)
Transport services	-.20849 (.1370273)	-.1617282 (.1316573)	-.2277348* (.1341205)
Gross capital formation	1.090748*** (.2506635)	1.128309*** (.2268849)	.9598423*** (.2348024)
Foreign direct investment	.7048714 (.3617038)	.6277039* (.329172)	.8626043** (.3381003)
Constant	35.02589 *** (11.93093)	28.51467 ** (11.76535)	24.95943 ** (11.60324)
Observations	627	627	627
Number of countries	33	33	33

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' Calculation with STATA 14

The effect of global value chain participation on the prices of agricultural products is presented in Table 4 above. Here, the variable forward participation has a negative effect on prices of agricultural product though significant only in one regression. The second target variable, backward participation has a positive and significant effect on prices of agricultural products. This means that the more African countries increase backward participation in global activities, the more it ameliorates prices of agricultural products. Concerning control variables in this regression, four of these variables (manufacturing value added, domestic credit to the private sector, labour force total and unemployment rate) have a negative and significant effect on the prices of agricultural products. Two control variables (human capital index and gross capital formation) have a positive and significant effect on the prices of agricultural products.

DISCUSSION OF RESULTS

The results presented above reveal that in the first specification (presented in Table 3a), forward and backward participation in global value chain has a positive and significant effect on agriculture value added in African economies. As for the second specification (presented in Table 3b), forward participation has a negative and significant effect on agriculture exports while backward participation has a positive and significant effect on the agriculture export in Africa. The third specification (presented in Table 3c) shows that

forward participation has a negative effect on prices of agricultural product while backward participation, has a positive and significant effect on the prices of agricultural products in African economies. The results from the three specifications identify backward participation to have the strongest and persistent positive and significant effect on all the three indicators of agriculture performance in African economies. Many studies equally confirm this positive relationship between the use of foreign imported inputs (backward participation) and increase in firm productivity growth in developing countries. Montalbano et al. (2018) found similar results in Latin America and Caribbean, Halpern et al. (2011) confirm it in Hungary, Amiti and Konings (2007) had similar results in Indonesia, Topalova and Khandelwal (2011) obtain the results in India. Other authors like Lopez-Gonzalez, (2016) identified foreign sourcing as complement and not a substitute to forward participation captured by domestic value added in Southeast Asia. Furthermore, Montalbano. And Nenci, (2020) examined the measures of GVCs participation and positioning developed by EORA data and assessed their effects on agriculture value added. Their results reveal that changes in GVC participation are positively associated with changes in agriculture value added, thus corroborating the positive and significant effect on agriculture value added in African economies.

It is worth noting that the findings of this study are consistent with the most recent literature and suggest that Africa as a whole is more integrated into GVCs than many other developing regions (Foster-McGregor et al., 2015). It also highlights that global linkages have been increasing over time even if much of Africa's participation in GVCs is essentially in upstream production activities, specializing in providing primary inputs to firms in countries further down the value chain (Del Prete et al., 2016).

CONCLUSIONS AND POLICY IMPLICATIONS

The results of the regression analysis in this paper indicate that the two types of global value chain participation (forward and backward) have a positive and significant effect on agriculture value added. The implication is that an increase in backward or forward participation leads to an increase in agriculture value added in African economies in various proportions. Furthermore, analysis of the effect of Global Value Chain Participation on agriculture export indicates that the variable forward participation has a negative effect on agriculture exports in all regressions implying that an increase in forward participation leads to a fall in agriculture export in African economies. Backward participation on the other hand has a positive and significant effect on the agriculture export of African economies. This means that, if African countries increase backward participation, it will increase the exportation of agricultural product. Three control variables (human capital index, access to electricity and labour force total) have a positive and significant effect on agriculture export. The analysis of the effect of global value chain participation on the prices of agricultural products indicates that the variable forward participation has a negative effect on prices of agricultural product. Whereas, the second target variable, backward participation has a positive and significant effect on prices of agricultural products. This means that the more African countries increase backward participation in global activities, the more it raises the prices of agricultural products. The main policy implication of these findings is that African economies should develop value chain activities inclined towards backward participation in global value chain. This implies adding more value to intermediate goods in the agricultural sector in order to trigger transformational change in the agricultural sectors to increase economic benefits.

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