
CAN A DEEP PREFERENTIAL TRADE AGREEMENT BOOST GLOBAL VALUE CHAIN PARTICIPATION IN SUB-SAHARAN AFRICA?

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Abstract

The increasing relevance of the global value chains (GVCs), and the deepening preferential trade agreements (PTAs), have recently increased the strength of globalisation. Hence, many developing countries are increasing their PTAs to reap the benefits of GVC. However, given the lack of the necessary financial means, and the low level of industrialisation, developing countries could remain providers of low-value primary materials, and miss out on the real gain of GVC. The present study examined if Sub-Saharan Africa's (SSA) preferential trade agreement increases their level of participation in GVC. A panel study approach was employed using data of some countries in SSA for the period 2000-2020 in static and dynamic models. The analysis showed that deep PTAs have a significantly positive impact on the level of GVC in SSA. It was found that the participation of SSA in GVC can be enhanced by the level of development and attraction of FDI. The previous levels of GVC were also found to have an increasing and significant impact on the current level of GVC participation in SSA. Increasing the depth and amount of PTAs, the level of development, and the ability to attract FDI are recommended to increase the level of SSA's participation in GVC. Also, an increase in access to tertiary education and the volume of export has the potential of increasing SSA's participation rate in the GVCs.

Keywords: Globalisation, global value chain, trade agreement, Tariff, Panel studies**JEL Classification:** C23, F13, F15**Article history-**Received: January 20, 2022, Revised: March 19, 2022, Accepted: April 1, 2022.**Introduction**

An important channel recognised for sustainable development has been international trade. Modern trade agreements are increasingly deep and the formations are based on the traditional free-trade theory which is a static theory. Trade agreements increased from 50 in 1990 to 280 in 2017 and covered multiple policy areas, more than 20 policy areas (World Bank, 2018). This has increased globalisation with the aid of technology and transportation advancements and globalisation has also been strengthened in the last few decades by the increasing relevance of global value chains (GVCs) and the deepening of preferential trade agreements (PTAs) (Ortiz-Ospina & Beltekian, 2018). In the twenty-first century, the dominance of the complex GVCs is being evidenced and it is possibly affecting the patterns of international trade. Information from Cigna, Gunnella, and Quaglietti, (2022) noted that the value of traded intermediate goods doubled globally and accounted for about 50 per cent of world trade while the pace of growth of world trade growth has outstripped the growth of world GDP. This is based on the principle of division of labour which is spreading to a global scale (Ruta, 2017).

On the other hand, PTAs are increasing and they are based on the increase in the volume and intensity of international trade (Czerewacz-Filipowicz, 2017). Modern PTAs are defined as “deep” agreements because they cover disciplines and commitments of governance that are always beyond the operations of the traditional World Trade Organisation (WTO), (Berger, Bender, Friesen, Kick, Kullmann, Robner & Weyrauch., 2016). This has been envisaged as a means of avoiding the infamous “middle-income trap (Berger et al., 2016). What then is the connection between preferential trade agreements and global value chains have? GVCs are claimed to serve as a “catalytic role for development” as it enables developing countries to industrialise by joining value networks as well as being positively connected with productivity increases and growth (United Nations on Trade and Development, 2013).

Current studies tend to support positive connectivity between the increasing GVCs and the deepening of PTAs (Berger et al., 2016; Peng, Kang, Liu, Cheng & Ren 2020). The pattern of deep agreements tends to be sharpened by GVCs. Deep PTAs are believed to enhance countries' involvement in GVCs thereby boosting the integration of GVCs. This means that policymakers can make use of trade agreements in securing national producers in the global and regional production processes (Ruta, 2017; De Soyres, Maire, & Sublet, 2021). Hence, reducing the depth of trade agreements will hamper GVCs (World Bank Group & WTO, 2017). However, the GVC - PTA connectivity will crucially be based on the continuation of trust and willingness of partners/countries to secure a continuous open trading system (Ruta, 2017). For the developing countries, GVC may cause their potential exclusion as their firms do not have the needed financial means and the global players' support. As a result of this, it is very much likely that developing countries can remain only the providers of low-value primary materials while they do not have the advantage of industrialisation and value-added activities which are usually mid-way steps towards a modern, diversified and prosperous economy. This might make them face the threat of remaining at the low level of the chain, with limited learning and upgrading opportunities (United Nations Industrial Development Organisation (UNIDO), 2015).

Africa plays only a marginal role in world trade. Its share of global exports is 3 per cent, with Sub-Saharan Africa (SSA) accounting for just 3 per cent (World Trade Organisation, 2021). Total trade from Africa to the rest of the world was on average US\$760 billion in current prices between 2015–2017, as compared with, \$4,109 billion from Europe, \$5,140 billion from America, and \$6,801 billion from Asia (United Nations Conference on Trade and Development (UNCTAD), 2019). For many Sub-Saharan African countries, imports and exports of goods and services as measures of foreign trade account for about 50 per cent of GDP. Hence, there is a high dependency on imports, which is much higher than exports. This is strong import dependency is reflected in statistics with the share of GDP accounting for more than twice the share accounted for by exports. For instance, in Mozambique, trade represents 96 per cent of GDP with exports accounting for only 26 per cent, for Rwanda, trade accounts for 45 per cent of GDP and export 15 per cent of trade while for Kenya, trade accounts for 50 per cent of GDP and export only 16 per cent (Taglioni & Winkler, 2016). Industrialisation which is a tool of GVC showed that African countries are far below. For instance, manufactured goods in total merchandise exports (%) for Africa was 51.2 which was second to the lowest, Oceanic which had 40.7. Trade-in intermediate goods as a major indicator of participation in GVC showed that Africa's share of intermediate goods in total export was the highest, 66.4 per cent in 2019. But, the aggregate data revealed that Africa's integration in global production networks was only mainly as suppliers of upstream intermediate inputs (World Trade Organisation (WTO), 2021).

Irrespective of the number of arguments in previous literature, some sides of the PTAs and GVCs connectivity have not been incorporated into formal models. For example, the prime question of the role of deep agreements in enhancing Sub-Saharan's GVCs has not been strenuously investigated. Thus, it has become imperative to ask if developing countries can gain from the GVCs using the formations of PTAs. Do preferential trade agreements increase the level of GVC integration/participation for SSA? Hence, the objective of this study is to evaluate the nexus between deep PTAs and GVCs in sub-Saharan Africa and to determine if SSA preferential trade agreement increases their level of participation in GVC.

Although there is a large quantum of literature on GVCs upgrading, and a growing body of literature on deep PTAs, research investigating the connectivity between the two is rare, especially for developing countries that have just signed or are currently negotiating deep PTAs to move up the GVCs' ladder. Thus, this study fills the gap in the previous studies by acknowledging the significance that developing countries integrating into global industrial networks cannot be neglected. Developing countries, on the other hand, may have to choose between the benefits of deep economic integration, and the restrictions on their policy right, which prevent them from enacting complementary policies to encourage local industrial development and upgrading in GVCs. This study recognises the negative consequences that can come from barriers to trade in GVCs, and the need for developing countries to combine their participation in GVCs with domestic policies by accounting for the trade-offs between trade and

industrial policy goals in a GVC environment. This study uses Sub-Saharan Africa as a case study to fill this gap in the research. It is an appropriate case in point because of its rapid pace in concluding deep PTAs and its policy goal of advancing up the value chain through enhanced international economic integration. The findings will be useful for all nations considering joining or negotiating a deep PTA.

Literature Review

Conceptual issues

The concept of GVC can be traced to Porter (1986) in Kaplinsky, (2004) who defined it as a group of interdependent and coordinated forward and backward activities making it possible to create measurable value for goods and services. Following this, many other economists have come up with different definitions. Kaplinsky (2004) defined it as all form activities that have to do with the bringing of products and services together from different phases of production which is delivered to the consumers while, Greffi and Fernandez-Stark (2011), defined GVC as all interconnected process of production of goods and services from the conception stage to the distribution of the final consumers. In a more recent definition, Antràs (2020a) defined GVC to consist of a series of stages that have to do with the production of products and services that are sold to consumers, where each stage are adding value. United Nations Industrial Development Organisation (UNIDO) (2009b), on the other hand, defines value chains as mechanisms that allow producers, processors, buyers, sellers, and consumers separated by time and space gradually add value to products and services as they move from one link of the chain to the other. Global value chains (GVCs) breaks up the production process so that at different steps, different production stage can be carried out in different countries.

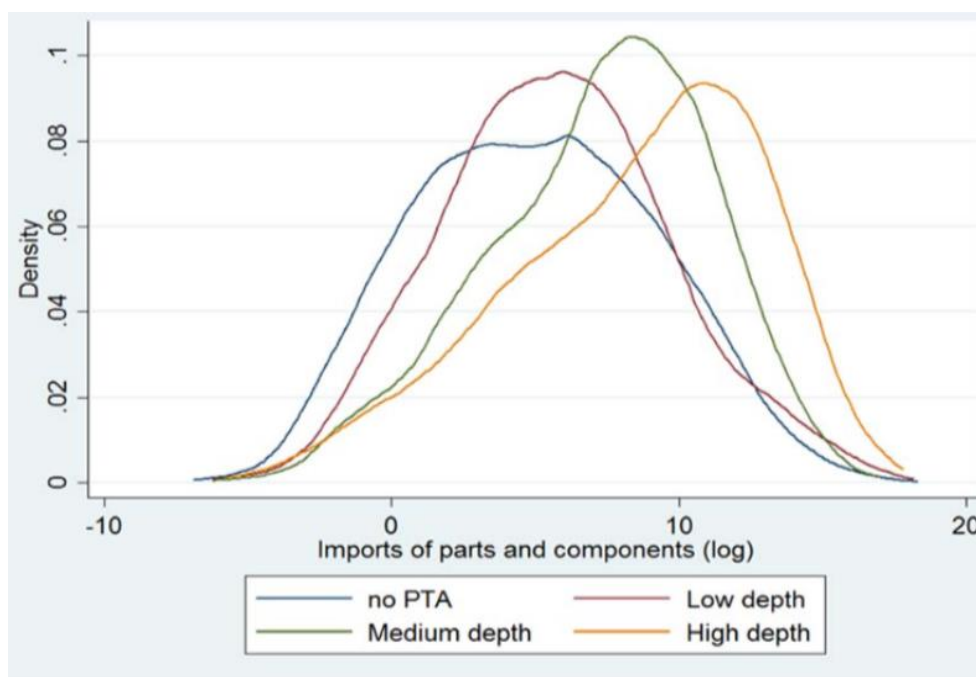
Preferential trade agreements (PTAs), have to do with a group of countries going into some levels of agreement building on the commitments of the WTO. They are defined as “a trade pact between countries that reduces tariffs for certain products to the countries which sign the agreement. While the tariffs may not necessarily be eliminated, they are lower than countries who are not a party to the agreement”. PTA has only become proliferated and widespread in 1990 with only 70 PTAs in force. However, in 2010, there has been an acceleration in PTA participation to almost 300 PTAs (WTO, 2011). In line with the above, there is also a transformation in the content of PTAs with deepened policy areas coverage (see figure 1). New agreements have also begun going beyond liberalisation of a tariff into including areas such as inter-movement of capital, investment, intellectual property rights, services trade, among others (World Bank Group & WTO, 2017).

The theoretical link between PTA and GVC

Theoretical literature tends to conclude that trade agreements are out to solve the problem of internalising the externality created by terms of trade through unilateral tariffs (Ruta, 2017). However, over the years, there has been a simultaneous increase in the number of PTA as well as GVC. Data showed that GVC has increased about six times from 1990 to 2015 and preferential trade agreement has also increased rapidly, increasing from 50 in 1990 to 285 in 2018 (World Trade Organisation, 2021). What now is the link between PTA and GVC? A positive correlation is found to exist between GVC (trade-in part and components) and trade agreements which are determined by the number of areas the policy areas covers. This relationship shows that the arguments for trade agreements seem more complex than it seems especially in the context of the global value chain.

Trade agreements can be deep or shallow. Shallow agreements are PTAs that focus on tariffs and other borders which affect market access. They are trade agreements that cover deals and borders. Economic theory suggests a close link between cross-border production and shallow PTAs (figure 2). Deep agreements on the other hand are preferential agreements beyond traditional market access and include agreements on other areas such as investment, competition policy, or the harmonisation of product regulations (Ruta, 2017). Deep PTAs include rules on other domestic policies. Generally, global sourcing by firms implies that higher tariffs are usually imposed to protect a domestic industry, which can lead to higher input costs for domestic producers. The deeper the PTA, the higher the amount and depth of GVC. Thus, deep PTA boost GVC.

Figure 2: GVC and PTA linkage.



Source: Adopted by Ruta (2017)

Empirical literature

Literature on GVCs has investigated the measurement of GVC participation, the driving forces as well as the effects of GVC trade, its potential, and challenges for developing countries (Kowalski, Gonzalez, Ragoussis, & Ugarte, 2015; Taglioni & Winkler, 2016 among others). The study on the effect of the global value chain was first carried out by Koopman, Wang, and Wei (2012). They divided the Chinese input-output tables into smaller accounts; activities on export processing and other activities.

A further elaboration of this approach was carried out by Tang, Wang, and Wang (2014). They considered the changes in some firm characteristics of firms such as the size, and the ownership (domestic/foreign, private/public). The Chinese's input-output tables were also employed but this time combined with data from the industrial census and trade statistics of different types of China. The study found that ownership structure impacted greatly the privatisation programme of China, which enhanced the upgrading of the domestic value chain. Ma, Wang, and Zhu (2015) also integrated the approaches of Koopman et al. (2012) and Tang et al. (2014) in examining the heterogeneity of firms in two dimensions of trading mode (processing exporters/normal exporters, plus non-exporters) on the one hand, and firm characteristics (domestic-owned/foreign-owned) on the other hand. They made use of the information on ownership structure and worked out the distribution of domestic value-added as it relates to factor ownership. This was found to contribute to the conversion of measurement from gross domestic product to gross national income accounting for firm heterogeneity.

Following this, the connectivity between cross-border production and the depth of PTAs was investigated by Osnago, Rocha, and Rutta (2016). The result revealed that the signing of deep PTAs by countries enhances total trade by 25 per cent and 23 per cent of foreign value-added gross exports. Findings also pointed out that creating extra rooms for PTAs will increase the parts and components of trade as well as the gross export foreign value-added. Rubinova (2017) illustrated that agreements on free trade expand GVC trade among developed and developing countries. The deeper integrations, the more the production fragmentation which will open up avenues for developing countries to take more part in the upstream stages. Following, the study of Rubinova (2017), the Organisation for Economic Co-operation and Development (OECD) (2018) showed that although there has been a fall in the level of the global GVC integration from 2011 when there was a global peak, the level is still remarkably

high. Among the factors that accounted for the fall was China's drift away from export-driven manufacturing production, toward its domestic markets. Also, they were rising wages rates, and the overall transformations in the strategies employed by China's firms were found connected to the digital economy, robotisation, and servicification.

Laget, Osnago, Rocha, and Ruta (2019) investigated the impact of deep trade agreements (DTA) on the linkages of bilateral cross-border production. Results revealed a positive impact of DTA on GVC which was through the value-added by intermediate goods. This was found higher in the services sectors than in other sectors. This impact was found to vary by the income group of the countries. Provisions on reduction of tariffs and customs drove the effect of DPTA on the trade in the South-South. Peng, Kang, Liu, Cheng, and Ren (2020) examined the connectivity between China's trade agreements (TAs) and its partner countries in the enhancement of GVCs. Employing the structural equation model (SEM), on the dataset from 216 countries, for 2010–2015, the outcome showed that the partner countries of China's TA will be more included in the OBOR vision than they will with countries who are not in the TA partner. China's TAs and OBOR vision are positively related to export, among others and the partner countries' enhancement in GVCs were of different degrees. Thus, countries in the low and middle part of GVCs in partnership with China may benefit more from China's TAs than the richer and high-end countries.

Urata and Baek (2020) attempted in identifying the firm and country-related factors that will determine the probability of a firm participating in global value chains (GVCs) as well as the level of GVC participation. They made use of the World Bank's Enterprise Surveys data, on 111 countries and 38,966 firms for the period 2009–2018 focusing on SMEs. The outcome of the analysis showed that for firm-related factors, high labour productivity, the large size of the firm, foreign ownership, and high technological capability particularly for SMEs are crucial for a firm's participation in GVCs as well as to increase their level of engagement in GVC networks. As it affects the country, a high degree of openness to trade and foreign direct investment inflows, availability of highly educated people, well-developed infrastructure, efficient logistics, and good governance are crucial to enhance the participation in GVCs and increase the level of participation. Obasaju, Olayiwola, Okodua, Adediran, and Lawal (2021), investigated the impact of economic upgrading of the global value chain through regional economic integration. Three integrations were used (East African Community (EAC), Southern African Customs Union (SACU), and the Economic Community of West African States (ECOWAS)) over the period 2000 to 2015. The Least Square Dummy Variable (LSDV) was employed, and the outcome revealed that integration does not drive members' upgrade in contribution to GVCs. However, regional integration was found to significantly impact the productivity of labour.

Methodology

Theoretical framework

The research is based on Krugman's New Trade Theory (NTT), which he developed in the 1970s and 1980s as the leading researcher in the field. Helpman and Krugman later generalized it in 1985. The New Trade Theory does not rely on given comparative advantages to explain trade patterns and benefits but focuses on intra-industry trade or simultaneous exports and imports of identical items. It is based on production technology with increasing returns to scale in an imperfectly competitive market. It encouraged the prevalence of intra-industrial trade between countries that have similar technology and resource endowments. It also explained observable specialisation and trade patterns between countries that do not differ in terms of technology or endowments a priori. It was evident by the 1970s that intra-sectoral trade between nations with similar features expanded faster than inter-sectoral trade between them (Inomata, 2017). Thus on this foundation, international trade is not only the movement of final products according to the classical theories, rather it has metamorphosed into a cross-national transfer of tasks, or the added value from the different tasks (Inomato, 2017).

Model specifications

This study adapted the Rubinova (2017) function model which studies deep free trade agreements and global value chain integration using foreign direct investment, high technology, school enrolment, and export to measure the global value chain index. High technology was dropped from Rubinova (2017) given that tertiary school enrolment will account for it as knowledge of technology is learned at the tertiary level. A tariff was added to the model to account for the depth of integration. Thus, the model for this study is stated thus:

We begin with the panel Ordinary Least Square (OLS) regression model:

$$GVC_{i,t} = \alpha_0 + \theta_1 TTARF_{i,t} + \theta_2 FDI_{i,t} + \theta_3 EXP_{i,t} + \theta_4 IMP_{i,t} + \theta_5 TERENR_{i,t} + \theta_6 GDPpc_{i,t} + V_{i,t} \quad (1)$$

Where:

$GVC_{i,t}$ Is the global value participation index. It was created using the UNCTAD-Eora GVC 25 sector version of the database. It measured the number of a country's exports in the multi-stage trade process. It is evaluated as the sum of the country's export foreign value-added and the value-added supplied to other countries' exports which is a ratio to gross exports. $TTARF_{it}$ is the simple mean of all products (%). It is used to capture the depth of the free trade agreement. It is expected that $TTARF_{it}$ will be positively related to GVC. $TTARF_{it}$ will enhance the level of GVC, particularly with a deep agreement that requires policy agreement. FDI is the foreign direct investment, net inflows (% of GDP). EXP_{it} is the total Exports of goods and services (% of GDP). IMP_{it} is the total Imports of goods and services (% of GDP). $TERENR$ is the tertiary gross enrollment in percentage. This measure is used to measure the level of technology transfer that will enhance the production of manufactured goods which will increase the amount/degree of the global value of a country. $GDPpc$ is GDP per capita at constant 2010 US\$. This is a measure of the level of development of a country. It is expected that the higher the level of development the more developed is the industrial sector which will be which will increase the production of manufactured goods that can increase their contribution to the global value chain.

α_0 is the constant term across the individual. $\theta_1: \theta_4$ are the coefficient of the explanatory variables. $V_{i,t}$ is normally distributed with zero mean and constant variance. Panel OLS estimates in practice can be inefficient due to country-specific and time-specific effects. Including one of these into the equation gives:

$$GVC_{i,t} = \alpha_0 + \theta_1 TTARF_{i,t} + \theta_2 FDI_{i,t} + \theta_3 EXP_{i,t} + \theta_4 IMP_{i,t} + \theta_5 TERENR_{i,t} + \theta_6 GDPpc_{i,t} + FE_i + V_{i,t} \quad (2)$$

Where FE_i is country fixed effects. From this we have;

$$GVC_{i,t} = \alpha_0 + \theta_1 TTARF_{i,t} + \theta_2 FDI_{i,t} + \theta_3 EXP_{i,t} + \theta_4 IMP_{i,t} + \theta_5 TERENR_{i,t} + \theta_6 GDPpc_{i,t} + FE_i + FE_t + V_{i,t} \quad (3)$$

Where FE_t is the time fixed effect.

Equations 1 and 2 are known as one way fixed-effect models while equation 4 is a two-way fixed-effect model.

Alternatively, the random effect model can be derived as

$$GVC_{i,t} = \alpha_0 + \theta_1 TTARF_{i,t} + \theta_2 FDI_{i,t} + \theta_3 EXP_{i,t} + \theta_4 IMP_{i,t} + \theta_5 TERENR_{i,t} + \theta_6 GDPpc_{i,t} + V_{i,t} + M_{i,t} \quad (4)$$

Where $v_{i,t} = FE_i + M_{i,t}$ normally distributed with zero mean and constant variance. A two-way random effect model is

$$GVC_{i,t} = \alpha_0 + \theta_1 TTARF_{i,t} + \theta_2 FDI_{i,t} + \theta_3 EXP_{i,t} + \theta_4 IMP_{i,t} + \theta_5 TERENR_{i,t} + \theta_6 GDPpc_{i,t} + N_{i,t} \quad (5)$$

Where $N_{i,t} = FE_i + FE_t + M_{i,t}$ normally distributed with zero mean and constant variance.

The Hausman test was used to determine whether the fixed effect or random effect model is the best in line with common practices. To determine if there exists dynamic connectivity between free trade and GVC, the study adopted the system Generalised Method of Moment (system GMM) estimator of Blundell and Bond (1998). The system GMM is specified as

$$GVC_{i,t} = a_0 + a_1GVC_{i,t-1} + \theta_1TTARF_{i,t} + \theta_2FDI_{i,t} + \theta_3EXP_{i,t} + \theta_4IMP_{i,t} + \theta_5TERENR_{i,t} + \theta_6GDPpc_{i,t} + E_{i,t}. \tag{6}$$

The instrumental variables adopted is $GVC_{i,t-2}$

Method of data analysis

The study made use of the generalised method of moments (GMM) to estimate the dynamic model. For the static model, the panel lease square, the fixed effect, and the random effect models were estimated. However, the model that performs best is expected to be used for the policy implication on a static state. The choice between the use of fixed effect and the random effect model was determined using the Husman test. The GMM was used to determine the dynamic impact of PTA on GVC. Using GMM will correct the endogeneity, heteroscedasticity, and cross-sectional dependency problems that are common in the panel data framework (Sarafidis, 2008).

Data sources

The study employed an unbalanced panel data of twelve (12) SSA countries for the period 2000 to 2020. The selected countries are Angola, Botswana, Cote d’Ivoire, Ethiopia, Ghana, Kenya, Nigeria, South Africa, Rwanda, Tanzania, Uganda, and Zambia. The data for the study was obtained from the World Trade Organisation (2021) and the World Bank database (2021). The quantitative estimation for the study was done using the Eviews 10.0 version of the econometric software package.

Results and Discussions

Descriptive analysis

The result of the descriptive analysis shows that all the variables are positively skewed since their means are greater than their medians and are not symmetrical because their skewness coefficient is positive.

Table 1: Descriptive Statistics

Statistics	GVC	FDI	EXPT	IMP	TTARF	GDPpc	TERENR
Mean	8.85594	2.79979	27.6210	30.4457	7.21987	2028.451	5.36359
Median	8.73000	2.17000	25.1900	30.0500	7.19000	1085.880	2.81000
Maximum	17.6967	24.0000	89.6800	74.9400	28.3400	8810.930	30.2300
Minimum	2.89010	-6.36000	0.00000	0.00000	0.00000	111.9200	0.00000
Std. Dev.	3.26427	3.12364	16.3425	13.1995	6.82282	2115.740	6.95894
Skewness	0.67319	2.05285	0.70602	0.23766	0.71844	1.494804	1.56431
Kurtosis	3.25299	15.1437	3.35841	3.89172	2.91985	4.10223	4.86479
Jarque-Bera	18.6890	1636.42	21.1349	10.1683	20.6239	101.1036	132.104
Probability	0.00009	0.00000	0.00003	0.00619	0.00003	0.00000	0.00000
Sum	2116.57	669.150	6601.42	7276.53	1725.55	484799.7	1281.90
Sum Sq. Dev.	2535.99	2322.19	63564.52	41466.02	11079.10	1.07E+09	11525.57
Observations	239	239	239	239	239	239	239

Source: Authors’ computation, 2022.

The positive values of the kurtosis of all the variables established the fact that the variables are leptokurtic. The values of the Jarque-Bera statistic show that all the variables are normally distributed since the p-values are statistically significant at a 5 per cent level of significance. Hence, the result shows that the Global Value Chain, Foreign Direct Investment, Export, Import, Total Trade Tariff, Gross Domestic Product Per Capita, and Tertiary Gross Enrollment Rate are normally distributed. Also, the level of variability or historical volatility (standard deviation) was found to be highest in the level of development of the countries and this was followed by export. The degree of participation in the global value chain and the FDI had the lowest variation. This showed that the degree of variation in the participation in the global value chain (GVC) integration is narrow among the different countries in the SSA. This can be attributed to their level of development and the amount of FDI they can attract.

Correlation result

The intensity of the multi-collinearity among the variables was determined using the correlation matrix. As presented in table 1, there is no perfect multi-collinearity among the variables.

Table 2 Correlation matrix result

	GVC	TTARF	FDI	EXPT	IMP	TERENR	GDPPC
GVC	1						
TTARF	0.112976	1					
FDI	-0.132381	-0.072754	1				
EXPT	-0.182258	-0.08988	0.143152	1			
IMP	-0.141628	-0.089084	0.255647	0.730247	1		
TERENR	-0.084099	-0.213387	-0.0312515	0.193595	0.275242	1	
GDPPC	0.054719	-0.301189	-0.209010	0.469631	0.281131	0.632785	1

Source: Authors' computation using Eviews 9 on the data, 2022.

Static analysis

The static analysis is carried out using the panel least square, fixed effect and random effect models. The most efficient model will be adopted for policy implications.

Table 3: Panel Models

Predictors	Panel OLS	GVC: FEM (1)	GVC: FEM (2)	GVC: REM (1)
(Intercept)	8.980900 (0.000)	10.34252 (0.000)	11.39246 (0.000)	10.18827 (0.000)
FDI	-0.014549 (0.838)	-0.048498 (0.300)	-0.051603 (0.287)	-0.045252 (0.332)
EXPT	-0.082337 (0.001)*	-0.014823 (0.439)	-0.006040 (0.767)	-0.014481 (0.440)
IMP	0.032801 (0.174)	-0.022678 (0.210)	-0.036828 (0.064)	-0.021491 (0.232)
TTARF	0.075226 (0.017)*	0.060170 (0.004)*	0.072691 (0.001)*	0.059678 (0.005)*
GDPpc	0.000670 (0.000)*	-0.000242 (0.167)	-0.000617 (0.011)*	-0.000176 (0.293)
TERENR	-0.132484 (0.001)*	-0.036419 (0.208)	-0.070344 (0.027)*	-0.040436 (0.159)
Total panel (unbalanced) observations	239	239	239	239
R-squared	0.123464	0.706927	0.726400	0.087073
Adjusted R-squared	0.100795	0.684382	0.677640	0.063463

FEM: Fixed effect model, REM: Random Effect model. (1): One-way, (2): Two-way * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$. The standard errors and probabilities are in bracket respectively.

Source: Authors' computation, 2022.

Table 4: Hausman Test

Model	Chi-Sq. statistic	p-value
FEM(1), REM(1)	4.301034	0.6360

FEM: Fixed effect model, REM: Random Effect model* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$.

Source: Authors' computation, 2022.

Hausman test is commonly adopted in literature when deciding which model, fixed or random model is more efficient and consistent (preferable). The test checks the null of efficient and consistent REM against the alternative hypothesis. From the result presented in Table 4, for a one-way fixed-effect model comparison with a one-way random effect model, we fail to reject the null hypothesis since the p-value is greater than 0.05 and concluded one-way REM is preferable.

The static analysis interpretation was based on the REM. The results indicate for a unit increase in total trade tariffs, GVC increases by 0.05. This positive relationship is statistically significant and at a 5 per cent significance level. However, export harms GVC. That is, a unit increase in export ratio leads to a 0.01 decrease in GVC. This relationship is statistically insignificant. A unit increase in imports leads to a 0.02 decrease in GVC. In other words, there is an inverse relationship between import and GVC, and this relationship is statistically insignificant. On the other hand, a unit increase in FDI leads to a decrease in GVC. This showed FDI has a negative relationship with GVC and is statistically insignificant. Gross Domestic Product per capita and tertiary gross enrollment rate have an inverse relationship with GVC.

However, this insignificant impact may be a result of the poor educational system in SSA countries that hinder expert participation in the global value chain. However, the poor random effect result of the static estimation could not be adopted for policy implication, and this prompted the Dynamic GMM estimation.

Dynamic analysis

To understand the dynamic relationship, the system Generalised Method of Moment (GMM) was estimated and presented in table 5. The estimation of GMM requires setting instruments. In this case, the lag of GVC was adopted as an instrument. The GMM can correct for endogeneity and autocorrelation which is common in panel studies. The result is presented in Table 5

Table 5: Dynamic analysis (System GMM)

Explanatory variables	Coefficient
	1.346763
GVC(-1)	(0.0000)**
	0.186782
FDI	(0.0032)**
	0.049338
EXPT	(0.1239)
	-0.056991
IMP	(0.1491)
	0.024183
TTARF	(0.0032)**
	0.000939
GDPPC	(0.0073)***
	-0.121109
TERENR	(0.0452)
	-3.260962
Constant	(0.5342)
Num. obs.	214
J- Statistics	2.646589
Prob(J-statistic)	0.754275

*Probabilities in the bracket; Null hypothesis of Sargan /Hansen/J test: All instruments are valid. *indicates significance at a 5 per cent level of significance.*

Source: Authors' computation, 2022.

Table 5 presented the dynamic results of the Generalised Method of Moment (GMM). The estimation of GMM requires setting instruments. In the result of system GMM, presented above, the J statistics which is Sargan implies our model does not suffer from over-identifying restrictions and the instruments used are valid. Also, the instrument rank of 12 is satisfactory supporting the validity of the result.

From the result, the previous value of GVC played a significantly increasing impact on its current value. This is however in line with expectation as there has been an increase in Africa's participation in GVC in terms of the GVC index engaging more than many other developing countries and some developed countries like the USA. Although, the rate of participation has not been uniform across the different countries of the region with several African countries participating in GVCs to a relatively large extent while others at a very low participation rate (Foster-McGregor, Kaulich & Stehrer, 2015). Yet, there is a significant impact of previous values of GVC on the current level of GVC. TTARF, FDI, EXP, and GDPPc were also found to have a positive and significant impact on GVC except for EXP, while TERENR and IMP were found to have a negative and insignificant impact on the GVC.

This result is in line with the predictions that foreign direct investment, total trade tariff, and gross domestic product per capita predict the Global Value Chain Index and are statistically significant at the 5 per cent level. However, contrary to expectation, a reduction in the tariff rates are expected to increase the depth of PTA which is expected to increase GVC. This evidence is in line with previous findings attesting to the fact that deep PTAs boost GVC Integration (Ruta, 2017; Rubinova, 2017; Urata & Baek,

2020). Although there is an inverse link between the tertiary gross enrollment rate and the global value chain, this is conflicting with the findings of Andolsek (2016), but it is statistically significant at 5 per cent. For instance, Urata and Baek, (2020) found that the availability of a higher level of education, inflows of foreign direct investment, as well as a high level of trade openness, significantly increase the engagement in GVC participation. However, some studies were inconclusive.

These data support the convergence hypothesis, which states that when institutions are in place, emerging countries tend to grow faster than developed countries. FDI also provides external finance for Sub-Saharan African countries which promotes their economic growth, productivity, and the transfer of new technology that enhances the production of manufactured goods thereby increasing GVC. The outcome of export suggests that operations in the export of goods and services have acted as a catalyst for the advancement of the global value chain. However, given the volume of transactions traded on the worldwide market floor daily, this conclusion is not surprising.

For instance, data showed that although there has been a gradual increase in Africa's trade of goods and services between 2005 and 2019, Africa accounts for only 3 per cent of global imports and exports (WTO, 2021). Africa operates more upstream exporting more of the primary inputs which have low competitiveness, and a very high volume of imports and this is limiting the possibility of the region upgrading in the GVC (Foster-McGregor, Kaulich & Stehrer, 2015). Specifically, the result showed that a 1 unit increase in previous values of GVC, FDI, TTARF, EXP, and GDPpc leads to a 1.346, 0.186, 0.0242, 0.0493, and 0.0001 increase in current values of GVC respectively. On the other hand, a unit increase in IMP and TERENR leads to a 0.0569 and 0.121 fall in current values of GVC respectively.

Conclusion and policy recommendations

Policy implications

This study examined the static and dynamic impact of preferential trade agreement measured as total tariffs trade, export as a per cent of GDP, and import as a per cent of GDP along with some control variables such as the level of development of the country on the global value chain. Panel data on sub-Saharan African countries for the period 2000 to 2020 were used employing the panel OLS, fixed effect, and random effect models for the static analysis while the system Generalised Method of Moment (GMM) was used for the dynamic analysis. However, the results of the dynamic analysis were used for drawing the policy implication given the poor performance that the static models. Based on these the following policy implications are drawn and recommendations made:

- Trade tariff was established to have a significant impact on GVC and positively related. This suggests that trade tariff and hence deep trade agreement is a major determining factor of GVC. The deeper the agreement (with the reduction/removal of tariffs) the higher the level of participation in GVC.
- The positive relationship but insignificant impact of export on the GVC index reveals that increasing the value of export, especially manufactured goods, will effectively increase the level of participation of SSA countries in the GVC. SSA countries will be able to operate downstream rather than just operating at the current upstream which has only marginal benefits.
- Tertiary gross enrollment was found to have a negative but significant impact on GVC. The low rate of gross tertiary enrollment which was used to capture the level of technology in the model will affect the activities in the industrial (manufacturing) and hence the value of export.
- The level of development captured by gross domestic product per capita was revealed that level of development is a significant factor in the level of GVC participation.
- The previous level of GVC was found to significantly increase the current level of GVC.

Following the above policy implication of the study, the study, therefore, recommends the increase in the depth of free trade agreement in SSA countries towards enhancing their level of GVC participation. The study also counsels that enhancing the industrial (manufacturing) sector should be a policy priority, especially the SMEs. It is in addition relevant to recommend this study that there is an urgent need for the increase in the rate of tertiary gross tertiary enrolment, especially in the science and technology area.

The policy of increasing development among which is poverty, inequality, unemployment, and illiteracy rate reduction are highly recommended. This will increase the level of development, and hence, the level of GVC participation of the countries in the regions. Furthermore, the study recommended that SSA countries should continue to strive in their efforts to increase participation in GVCs. This particularly can be done by collective effort, through deep trade agreements. Finally, for further study, this study recommends examining the role played by the institutional quality of sub-Saharan African countries in improving the global value chain integration in Africa.

Conclusion

GVCs suggest a close trade and investment difficulties link, both traditional trade obstacles and behind-the-border policies significantly impact countries' participation in global value chains and acquired value. Deep PTAs, which have evolved in recent decades, do not only eliminates tariffs but also encompass a wide range of other areas of policy, offering a framework for economic governance and supporting local institutions. Hence, their importance in terms of integrating into global industrial networks cannot be overstated. However, developing nations may confront a deep economic integration benefit trade-off with the limitations of their policy right that prohibits their implementation of complementing measures that will support the development of industries and upgrading of GVCs. This study recognises the positive implications of little or no GVCs' trade barriers. Also, there is the need for developing nations to follow GVC participation with domestic policies thereby, addressing the trade and industrial policy objectives trade-offs in a global value chain setting.

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