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Article

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GENERAL & APPLIED ECONOMICS | RESEARCH ARTICLE

The determinants of participation in global value chains: The case of ECOWAS

Abdoulganiour Almame Tinta^{1,2*}

Abstract: Regional integration is the strategy adopted at the continental level to strengthen Africa's development. However, the different regional blocs already established on the continent face many challenges. Based on the economic integration of the ECOWAS (Economic Community of West African States) region, this research analyzes the role of participation to Global Value Chain (GVC) in international trade as a crucial factor. Using a gravity model with Panel using fixed effects, the findings show that intra-regional trade is not significant in the explanation of the trade openness degree of countries but an increase in backward integration to GVC raises trade openness. The results also indicate how the competitiveness of trade structure and the structural factors related to countries affect the performance of GVCs. Intra-regional trade must further be inserted in the production of final goods which involves the maximum number of countries for the intermediate steps.

Subjects: Industrial Economics; International Trade (incl. trade agreements & tariffs); Development Economics

Keywords: trade openness; regional integration; globalization

JEL classifications: F13; F15; O14

1. Introduction

One of the most discussed themes over the past two decades in research work, political discourse, and international media is regional integration. The extent of the emergence of regional integration

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PUBLIC INTEREST STATEMENT

Although trade in value chains has emerged in the early 2000s and has rapidly developed and imposed, empirical works are still missing: the links, the connections and the various implications in the value chain being not well received. GVC is an emerging opportunity for African countries to better insert in international trade and overcome barriers that obstruct their development. This research focuses on ECOWAS and addresses some questions unanswered by most studies: why regional integration really matters for members in African countries? Why opening the markets to States from the same integration before opening them to the rest of the world can be more interesting than move directly to multilateral liberalization? This indicates how regional integration can speed countries insertion into value chains. This result can be useful for policy-maker in designing adequate development strategies and efficient industrial policies for West African States.

remains closely linked to the rise of globalization and the need for countries to negotiate agreements to facilitate all forms of exchanges and transactions. The promises of regional integration since the publication of Viner (1950) and Balassa (1967) have had positive feedback for some groups of countries (NAFTA, MERCOSUR, ASEAN) and negative for others mostly African economies (COMESA, ECOWAS, ECCAS). However, regional integration remains crucial for Africa to increase its competitiveness and diversify its economy, and especially for fragile economies such as Economic Community of West African States (ECOWAS).

To benefit from the potential of regional integration, the authors (McCallum, 1995; Rose & van Wincoop, 2001) emphasize the need to fulfill certain prerequisites in order to avoid trade diversion such as geographical proximity, the rule of law, democracy and good governance, macroeconomic stability, political commitment, and the existence of real common interests. Common historical, cultural and political environments also have a favorable effect on regional integration. However, regional integration may prove difficult to boost intra-community trade when countries have different preferences or export incompatible products, as is the case in Africa. Despite the grouping of West African countries into a regional bloc and the reduction of tariffs within the Community, intra-regional trade (8.9% in 2014) is still marginal because of the low similarity (30% in 2014)¹ between countries products. How to increase intra-regional trade in spite of the difference in the member countries trade? Thinking about this issue, GVC can be the missing link to strengthen the regional integration and increase intra-community trade even if the similarity in term of trade among countries is weak. Therefore, understanding the role of participation to GVC on international trade can help African countries to take benefit from regional integration.

GVC is an emerging opportunity in recent years establishing not only an interconnection between countries but also raises their competitiveness in world trade (International Monetary Fund, 2016; World Trade Organization, 2014). Even if the trade structure of ECOWAS countries prevents them to compete within the integration and hinders their participation in the global market where products are subject to a highly competitive environment, creating a trade value chain inside the Community can overcome the challenges. This research analyzes the effect of an insertion to GVC on the degree of trade openness and the key determinants which indirectly affect GVC performance. Using the gravity model of trade (Choi, 2013; Noguera, 2012)² with UNCTAD data in ECOWAS countries, we measure GVC participation as mentioned in recent research (AfDB, OECD, & UNDP, 2014; De Backer & Miroudot, 2013; International Monetary Fund, 2016; OECD, WTO (Organisation for Economic Co-operation & Development, World Trade Organization), & The World Bank, 2014; World Economic Forum, World Bank, & African Development Bank, 2015) by backward integration which captures the extent to which domestic firms use foreign intermediate value added for exporting activities in a given country. Two broad factors have been identified in the literature to influence the degree and type of GVC integration: non-policy or structural factors and policy factors. Based on the gravity theory of trade, market size, level of development, degree of industrialization and trade costs are used as non-policy factors and trade performance indicators are used as policy factors.

The results indicate that intra-regional trade is not significant in the explanation of the trade openness degree of ECOWAS countries but an increase in backward integration raises trade openness. More precisely, intra-community trade is insufficient and unable to divert trade vis-à-vis the rest of the world, and backward integration is a powerful instrument for countries to strongly insert themselves in world trade. In addition, the performance of GVC is closely related to product diversification, foreign direct investment inflows, intra-community trade, the level of development, the degree of industrialization and domestic value added. The study contributes to the literature on international trade and GVC by analyzing the impact of regional integration, and empirically examines the implications that previously were not included. Therefore, the study helps policy-makers to build adequate development strategies including trade and industrial policies for West African States in globalizing world.

The rest of the paper is organized as follows. Section 2 introduces the concept of GVCs and presents a brief literature review. Section 3 describes the methodology. Section 4 discusses the results and Section 5 concludes.

2. The concept of GVC and literature review

Although Hirschman (1958) already discussed backward and forward linkages, the concept of value chains was introduced by Porter (1985) in the industry sector and described all the activities that should work together harmoniously to produce and sell a product while making it possible for actors at all levels to obtain the highest possible profits. However, the application of the concept has extended over the years to areas other than industry with the development of international trade since the early 1990s, characterized by the increasing integration of the world economy. As a result, value chains have become more internationally segmented (Faße, Grote, & Winter, 2009; Gereffi & Fernandez-Stark, 2011). Production processes previously dispersed become connected offering a golden opportunity for many countries to intensify their comparative advantages. The processing of one product is carried out by different enterprises in several countries. Trade in GVC which Asia and Latin America have greatly benefited from is introduced in the early 2000s (Bair, 2005; Gereffi, Humphrey, & Sturgeon, 2003; Gereffi & Korzeniewicz, 1994) to designate the fragmentation of production process and trade between countries. It also explains why the benefits of economic integration fail to reach developing countries and their poor. This type of trade enables participating countries to enjoy a share of the value added of goods and services produced while previously participants unable to produce the goods and services were kept away.

The extent of the participation of a country into the GVC is appreciated by dissociating the value added embodied in the products based on sources of origin and final destinations. Under this method, the literature (Lenzen, Moran, Kanemoto & Geschke, 2013) defines foreign value added (FVA) and domestic value added (DVA). The FVA known as backward integration is the share of the imported value added from foreign suppliers upstream that will be found in the country's exports. This represents the country's place in the value chain. The DVA is the sum of domestic value added of products directly consumed in the country where it is exported and the domestic value added of products that enter into the production of other countries' exports. The share of exported domestic value added which will be reflected in the exports of other countries is known as forward integration. In the latter case, the country provides inputs for another country production. Combining backward and forward integration gives a measure of a country's total GVC participation.

In this context, World Economic Forum et al. (2015), Beck and Cull (2014), Taglioni and Winkler (2014), and AfDB et al. (2014), using descriptive statistics analyze the potential of GVC for Africa. Rashmi (2013) measures the participation of different countries in GVC and estimates distribution of gains between countries in terms of countries' shares in total value added created by trade under GVC. Rashmi concludes that it is therefore important to 'gainfully link into GVCs' in identified industries where the country is able to derive net positive domestic value-added gains. United Nation Economic Commission for Africa (2016) examines the potential of North Africa in the integration of regional value chains and shows that industrialization is essential to realize effective structural transformation, and the development of regional value chains can be an important lever to overcome the challenges that arise in the region.

If empirical studies on regional integration are numerous and very advanced, the empirical literature on the integration of value chains is very rare and even limited. The link between regional integration and trade is basically studied with Gravity models. Alemayehu and Haile (2002), Bayoumi and Eichengreen (1995), Evenett and Keller (2002), Matyas (1997), Wall (2000), Glick and Rose (2001) use gravity models to estimate the effect of regional integration on trade flows in Africa, Europe, or Latin America. It appears that regional integration has a positive effect on trade. Moral-Benito (2012) and International Monetary Fund (2015) discuss the relation between growth in GDP per capita in sub-Saharan African and trade openness. They find that increased trade openness and the improvement in terms of trade have accelerated per capita GDP growth in sub-Saharan Africa.

However, this increased trade integration has also made the region more vulnerable to external shocks. International Monetary Fund (2015) analyzes the missing link in sub-Saharan Africa's trade integration. By estimating gravity models covering 167 countries, the paper assesses the influence of geographical, institutional, and policy-related factors on bilateral trade flows.

Gravity models should be used with caution. The use of aggregate data (Baldwin & Taglioni, 2006), the use of distance to capture transaction costs, the use of binary variables, Rose biases such as aggregation bias, auto-selection bias, and endogeneity bias (Lochard, 2005) are among the various critics formulated and need to be taken into account. Also, Plummer, Cheong and Hamanaka (2010) emphasize the importance of binary variables that can be correlated with other factors such as regional production shares, the distribution of the technology or intra-community travel which could be the real drivers of the increased intra-regional trade.

The scarcity of econometric and empirical studies on GVCs integration is linked to the lack of trade input-output database on countries. It is only recently that databases have been built by OECD, UNCTAD and WTO using the methodology of Lenzen et al. (2013). However, the databases do not still include all countries because of missing information in some sectors. The few empirical studies are recent. International Monetary Fund (2015) examines the insertion in GVCs with an unbalanced panel for 185 countries by focusing mainly on the real GDP per capita effect on backward integration. The results show that for the entire sample real GDP per capita has a positive effect on backward integration but for the subsample of countries with GDP per capita at or below US\$22,000 backward integration and income levels are negatively related. Kowalski, Ugarte, Ragoussis, and Lopez Gonzalez (2015) realize several estimations to analyze the effect of GVCs participation on domestic per capita value added and diversification of exports across a sample of 152 countries. According to recent studies (International Monetary Fund, 2015; Kowalski et al., 2015; OECD et al., 2014), structural factors and policy factors are identified as the key determinants of a country's participation in GVC. The structural factors such as the market size or the level of development, degree of industrialization, and trade costs are based on the gravity theory of trade.

The domestic market size is expected to be a strong determinant of the volume of GVC trade through the economic mass of trading partners (Anderson & van Wincoop, 2003; Evenett & Keller, 2002). The backward integration should develop with industrialization due to technological development and the emergence of a competitive services sector (Lopez-Gonzalez, 2012). The distance to manufacturing hubs measures the costs of selling in foreign markets and affects backward integration. Policy factors are based on institutional approach and indirectly are associated with foreign direct investment, intra-regional trade, suitability of preferential trade agreement and trade performance indicators that can affect the competitiveness of the entire value chain (Miroudot, Spinelli, & Rouzet, 2013).

3. Methodology

3.1. Data and descriptive statistics

ECOWAS includes fifteen countries such as Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Ghana, Gambia, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo and the data used for the estimation cover the period 1995–2012 for each country. OECD TiVA and EORA provides intercountry input-output data that allows to determine Domestic value added, foreign value added, backward insertion and forward insertion to GVC. The computation of backward and forward insertion use Lenzen et al. (2013) framework with Inter-Country Input-Output (ICIO) system. The input-output covers 187 individual countries with 172 crops and is classified in 26-sector harmonized in basic prices and purchasers' prices. Table 1 contains for each country, primary input and final demand blocks, imports and exports itemized by partner.

$$DVA = \sum V_c W_c EXGR_{c,p,i} \quad FVA = \sum V_c W_c EXGR_{c,i}$$

Table 1. Panel unit root tests results

	Common unit root process		Individual unit root process					
	Levin, Lin & Chu t-stat		Im, Pesaran and Shin W-stat		ADF - Fisher χ^2		PP - Fisher χ^2	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Openness (1st differences)	-8.67593	0.0000	-8.22814	0.0000	107.198	0.0000	127.132	0.0000
Manufacturing value added	-3.1262	0.0009			40.1662	0.0639	56.460	0.0011
Intra-community trade	-2.53457	0.0056	0.46353	0.6785	22.3873	0.7631	29.712	0.3771
Domestic value added (1st differences)	-5.97155	0.0000			87.7214	0.0000	101.46	0.0000
Complementarity index	-2.84974	0.0022	-3.30902	0.0005	54.0375	0.0022	51.496	0.0044
Tariffs rate	-15.8138	0.0000	-7.33126	0.0000	48.3783	0.0049	57.1579	0.0004
Diversification indices	-5.79776	0.0000	-5.20552	0.0000	77.0805	0.0000	76.133	0.0000
Similarity in trade structures	-5.21027	0.0000	-4.47447	0.0000	73.3900	0.0000	70.750	0.0000
Real GDP per capita (log)	-1.85913	0.0315	-0.51043	0.3049	43.9010	0.0284	26.241	0.5598
Foreign direct investment	-3.20278	0.0007	-3.93766	0.0000	59.5463	0.0005	65.130	0.0001
Backward (1st differences)	-3.85097	0.0001	-4.31123	0.0000	77.8566	0.0000	87.502	0.0000

where DVA is the domestic value added in goods which captures value chains performance associated with exports of goods which accrue to domestic labor and capital; FVA is the foreign value added in goods and is related to the production and export of more-sophisticated goods; $EXGR_{c,i}$ represent Country c 's total gross exports for a given industry i ; $EXGR_{c,p,i}$ represents gross exports of intermediate goods and services from domestic industry i in country c to country p .

With global Leontief inverse $W = (I - A)^{-1}$, Value added to output ratio $V = VAL/PROD$, VAL = value added by industry and country; $PROD$ = Gross output by industry and country; Input coefficients, calculated as $A_{ij} = Z_{ij}/PROD_j$

$$\text{Backward indicator} = B = FVA/(DVA + FVA)$$

Backward integration is defined as the portion of the imported value added from foreign suppliers that will be part of the nation's exports. Backward integration targets the country export competitiveness. An increase in backward integration means an increase in FVA which involves that the country's exports are highly sophisticated. Therefore, an increase in backward integration is associated with higher per capita domestic value-added in exports and increasing income. A higher share of backward participation is also linked to access of competitive inputs and a more-sophisticated export bundle and greater diversification of exports over time (AfDB et al., 2014). Furthermore, backward integration addresses the demand side of value chains in terms of foreign sourcing.

$$\text{Trade openness} = L = \frac{\text{Total import} + \text{Total export}}{\text{GDP}}$$

$$\text{Intra - regional trade} = I = \frac{\text{Country's Export in ECOWAS}}{\text{Total Export}}$$

We choose as trade performance indicators complementarity index in products, similarity index, diversification and concentration index. The computation of the indicators based on UNCTAD data depends on the numbers of products exported by the country. For ECOWAS countries, the number of products varies between 9 for Guinea-Bissau and 168 for Nigeria. The total number of products in the world is 261. Trade complementarity index denoted C_p shows how well the structure of a country's

imports and exports match. It is based on the number of products traded by the country and assesses the suitability of preferential trade agreement.

$$Cp = 100 \left(1 - \sum \left(\frac{|m_{ik} - x_{ij}|}{2} \right) \right)$$

where x_{ij} is the share of good i in all exports of country j and m_{ik} is the share of good i in all imports of country k .

The diversification of product trade denoted D also called Finger-Kreinin index assesses the absolute deviation of the trade structure of a country from world structure. A value closer to 1 indicates greater divergence from the world pattern.

$$D = \sum_i (h_{ij} - h_i) / 2$$

where h_i is the share of product i in total world exports and h_{ij} is share of product i in total exports of country j .

The similarity index denoted S measures the extent to which two countries export the same products. It assesses trade competitiveness or the degree of sophistication in products.

$$S = \left(\sqrt{\sum_i \left(\frac{x_{ij}}{x_j} \right)^2} - \sqrt{\frac{1}{n}} \right) / \left(1 - \sqrt{\frac{1}{n}} \right)$$

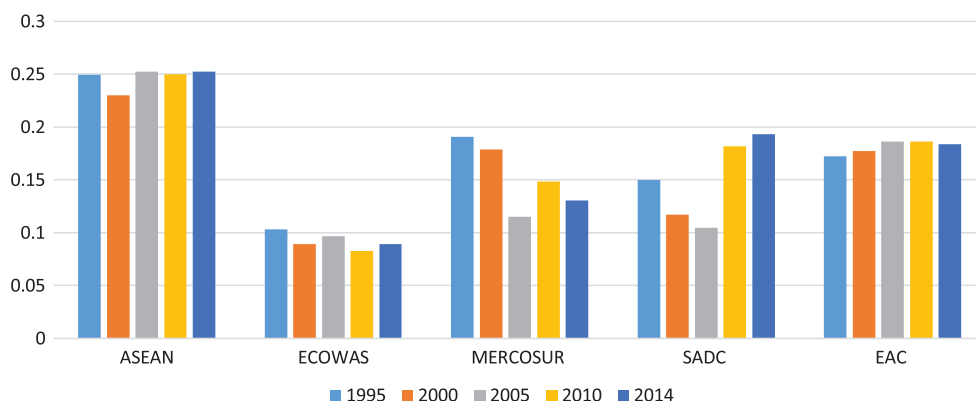
where x_{ij} is the value of exports for country j and product i .

A descriptive analysis of the data helps to examine the implications of the regional economic integration of West African States.

Intra-community trade (Figure 1) within ECOWAS is low. In 2014, intra- community exports are estimated at 8.9 against 13% for MERCOSUR (Southern Common Market), 18.3% for EAC (East African Community), 19.3% for SADC (Southern African Development Community), and 25.3% for ASEAN (Association of Southeast Asian Nations). If ECOWAS countries trade more with external partners than with their neighbors, this is related to the lack of interdependence among different economies. The establishment of a chain in the production process from upstream to downstream can make each country become more attractive and a key destination, which will amplify intra-community trade.

Figure 1. Intra-Community trade of selected integration in percentage.

Source: Author, based on IMF and UNCTAD data, 2017.
 Notes: ASEAN (Association of Southeast Asian Nations) ECOWAS (Economic Community of West African States) MERCOSUR (Southern Common Market) SADC (Southern African Development Community) EAC (East African Community).



The place of ECOWAS in trade value chains is exposed in Figure 2. The domestic value added of ECOWAS exports is very low. A small part of domestic value added (60 million US dollars) is exported to other countries. This result confirms that downstream integration probably is related to primary products. The forward integration of ASEAN is very strong, the domestic value added being high. We also note that foreign value added in ASEAN is close to the domestic value added, reflecting intense competitiveness in exports and a dominant position in the GVC. On the contrary, for ECOWAS and SADC, foreign value added is very low compared to the domestic value added. This result confirms the assertions that the insertion of Africa in the GVC is carried further downstream. Integration in the value chain within ECOWAS may be an initial support for implementing a production system based on a process of transformation in different countries.

The evolution of domestic value added and foreign value added within ECOWAS from 1990 to 2012 shows that the backward integration is stagnant compared to forward integration. Therefore, little effort has been done by ECOWAS countries to implement manufacturing structures. Within the area, the focus has been on the exploitation of raw materials or export of primary products. The lack of industrial development program explains the lack of export of manufactured goods, justifying why the foreign value added has marginally increased from 1990 to 2012 (Figure 3).

Within ECOWAS, only Nigeria, Ghana, and the Ivory Coast are more involved in the value-added chain. For other countries, foreign or domestic value added is very low. Figure 4 illustrates the challenge that integration must overcome and shows the urgency of industrial development for West Africa to actively participate in world trade. The establishment of a regional value chain is a way for ECOWAS to expand its participation in the GVC and indirectly improve the economic performance of each country.

Figure 2. Selected integration, domestic and foreign value added in US dollars.

Source: Author, based on OECD TiVA and EORA data, 2016.
 Notes: ASEAN (Association of Southeast Asian Nations) ECOWAS (Economic Community of West African States) SADC (Southern African Development Community).

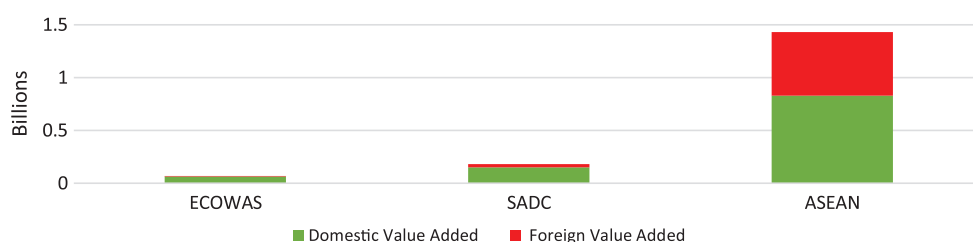


Figure 3. ECOWAS domestic and foreign value added in US dollars.

Source: Author, based on OECD TiVA and EORA data, 2016.

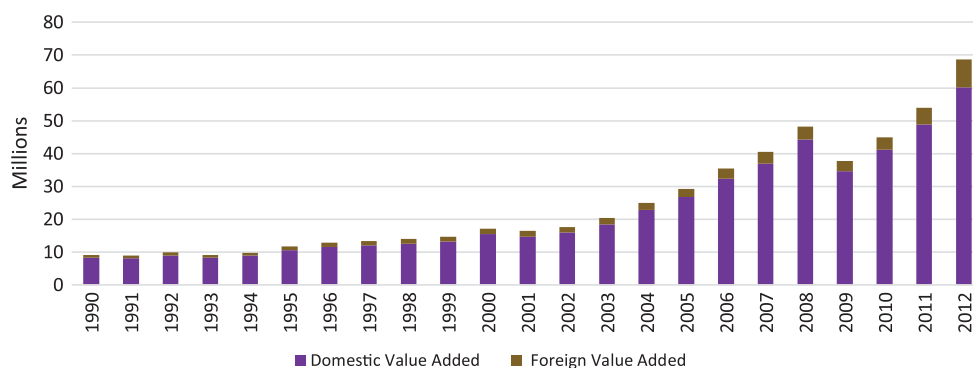
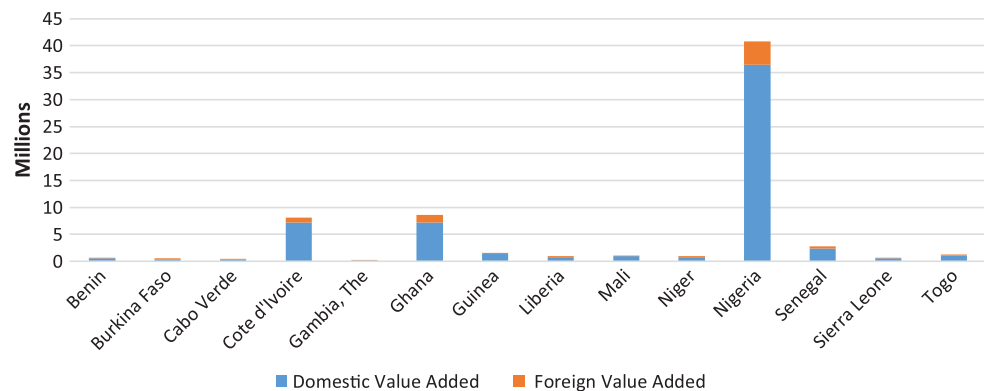


Figure 4. ECOWAS countries domestic and foreign value added, 2012.

Source: Author, based on OECD TiVA and EORA data, 2016.



3.2. Model specification

We estimate two separate equations based on the objectives. To analyze whether an insertion to GVC is crucial in countries openness to international trade, the estimation method follows the relevant literature on theory of economic growth which suggests a Panel with fixed effects. Even if the link between openness and economic growth is ambiguous, the pattern of international trade suggests that the level of opening up for trade in a country depends on the level of national income, the distribution of gains and the economies of scale. Thus, new growth theories assume that trade openness through liberalization is explained by variability in growth rate of GDP and major trade policy variables determining growth process (Edwards, 1998; Kalu, Nwude, & Nnenna, 2016; Nadeem, Muhammad, Namatullah, Muhammad, & Faiz, 2011). Therefore, the dependent variable is trade openness and trade policy variables including tariff rates are explanatory variables. The estimation might be biased by the presence of time specific omitted factors affecting both the dependent and the explanatory variables. Therefore, we include year fixed effect. Based on literature, we control for the insertion to GVC, measured by backward integration but lagged to address endogeneity issues. Other exogenous variables such as intra-regional trade, the level of development proxied by GDP per capita, tariff rates, foreign direct investment inflows in GDP and lagged per capita domestic value added which captures value chains performance associated with exporting which accrue to domestic labor and capital. The empirical model can be broadly specified as follows:

$$L_{it} = \delta_0 + \delta_1 I_{it} + \delta_2 dv_{it} + \delta_3 GDP_{it} + \delta_4 B_{it} + \delta_5 T_{it} + \delta_6 Fdi_{it} + \delta_i + \delta_t + \varepsilon_{it} \quad (1)$$

To analyze the determinants which indirectly affect GVC performance, we use the recent development of gravity model of trade (Choi, 2013; Noguera, 2012). Using this approach, the specification links backward integration as dependent variable to structural factors and policy-related factors such as intra-regional trade, foreign direct investment, the level of industrialization, the level of development, per capita domestic value added, diversification in goods, product complementarity, sophistication in goods and applied average tariffs. As previously mentioned, we include both country and year fixed effects to reduce any concern of omitted variable problem. Based on Anderson and van Wincoop (2003) and Baldwin (2006) critics, dummy and time constant variables and geographical parameters are not included in the model. The empirical specification can be summarized in the following equation:

$$B_{it} = \varphi_0 + \varphi_2 I_{it} + \varphi_1 T_{it} + \varphi_4 D_{it} + \varphi_5 S_{it} + \varphi_6 Cp_{it} + \varphi_7 dv_{it} + \varphi_8 GDP_{it} + \varphi_9 M_{it} + \varphi_i + \varphi_t + \varphi_{10} Fdi_{it} + \mu_{it} \quad (2)$$

With I_{it} intra-community export trade, D_{it} diversification index as a proxy of competitiveness and quality of integration with worldwide markets, S_{it} similarity index which measures the degree of specialization in the production, Cp_{it} complementarity, dv_{it} per capita domestic value added in lagged value to reduce simultaneity bias with backward integration, GDP_{it} real per capita GDP in logarithm, M_{it} share of manufacturing value added in GDP as a proxy of the level of industrialization, Fdi_{it} foreign direct investment inflows in GDP, B_{it} backward integration which is linked to the production of more-sophisticated export and T_{it} tariffs.

As described in Greene (2012), we first compute the panel unit root test to study the stationarity of each variable. Two types of panel unit root tests can be performed such as “common root” and “individual root”. Common root (Breitung; Hadri; Levin, Lin, Chu) indicates that the tests are estimated assuming a common AR structure for all of the series which means that the autoregressive coefficient for each variable is identical across cross-sections. Individual root (Im, Pesaran, Shin; Fisher-ADF; Fisher-PP) is used for tests which allow for different AR coefficients in each variable. In this case, the variable contains an AR structure but may vary across cross-sections. We secondly perform the Kao residual cointegration test (1999) which is based on Engle and Granger’s (1987) two-step cointegration tests. The Kao test specifies cross-sectional specific intercepts and homogeneous coefficients. It assumes that the panel is homogenous. If we have a model like (i), the Kao test considers the regression of Equation (1) by requiring α_i to be heterogeneous and β to be homogeneous across cross-sections and runs either the pooled auxiliary regression (ii) or the augmented version of the pooled specification.

$$y_{it} = \alpha_i + \beta X_{it} + e_{it} \quad (i)$$

$$e_{it} = \rho e_{it-1} + k_{it} \quad (ii)$$

If there is a cointegration, we thirdly perform a specification test to identify the exact functional form. The Hausman test compares the specification with fixed effects and random effects, and choose the best estimator. The null hypothesis is that there is no difference in the coefficients estimated by the efficient random effects estimator and the consistent fixed effects estimator. If there is no difference, the random effects estimator is used. Robust standard errors are used to address heteroscedasticity. Robust standard errors refer to White estimators of Variance. The results using White estimators of Variance (Robust standard errors clustered at the level of the countries) to address the heteroscedasticity concern are presented in Table 2. In the case of Model (2), an alternative estimation is done using forward integration as dependent variable.

Real GDP per capita, average tariff, trade openness and manufacturing value added come from the World Development Indicator. Intra-community trade and foreign direct investment come from UNCTAD (2017). Per capita domestic value added and backward integration are provided by OECD TiVA.

4. Empirical results and discussion

The stationary panel tests presented in Table 1 show that the majority of variables are stationary at 5% level of significance. Specifically, the results of common unit root (Levin, Lin Chu) show that variables such as similarity index, tariffs rate, complementarity index, diversification index, foreign direct investment inflows, intra-regional sector trade, per capita GDP and manufacturing value added are stationary at level at 1 or 5% level of significance. This indicates that for each variable there is not a common autoregressive structure for all of the observations. The results of individual unit root (Im, Pesaran, Shin; Fisher-ADF; Fisher-PP), except for intra-regional trade reject the null hypothesis which allows for different autoregressive coefficients in each series. Therefore, the two tests show that similarity index, complementarity index, diversification index, tariffs rate, foreign direct investment inflows, per capita GDP, and manufacturing value are integrated at level. Inversely, trade openness, backward integration, and per capita domestic value added contain common and individual unit root and need to be differenced to become stationary. Since all variables are integrated in first differences, we conduct a cointegration panel test to discuss the existence of a long-term relationship.

The results of Kao test (Table 2) for model (1) and model (2) reject the null hypothesis of no cointegration at 1% level of significance. Accordingly, the variables are cointegrated and the cointegration relationship can be run at level (first stage regression) as evidenced by the theory when the variables are integrated of order 1. As a result, the coefficients are homogenous and allow for panel specification.

Table 2. Results of panel regression of trade openness and backward integration

Variables	Model (1)	Model (2)		
	Trade openness	Backward		Forward
	Robust standard error coefficient	Ordinary coefficient	Robust standard error coefficient	Robust standard error coefficient
Share of manufacturing value added		−0.13938***	−0.13938***	0.06969***
		(0.05138)	(0.04177)	(0.02088)
Intra-community trade	0.34175	1.17773***	1.17773***	−0.48886***
	(1.49220)	(0.14740)	(0.38890)	(0.19445)
Per capita domestic value added (lag)	0.81497**	−0.08318*	−0.08318*	0.04159**
	(0.38380)	(0.04322)	(0.03827)	(0.01913)
Trade complementarity index		0.08715	0.08715	−0.04357*
		(0.06663)	(0.04663)	(0.02331)
Average tariffs rate	0.46016	0.13872***	0.13872***	−0.06936***
	(0.46732)	(0.05233)	(0.06902)	(0.03451)
Merchandise diversification indices		1.49819***	1.49819***	−0.74909***
		(0.2831)	(0.39909)	(0.19954)
Similarity in merchandise trade		1.38605***	1.38605***	−0.69302***
		(0.28542)	(0.39780)	(0.19890)
Real GDP per capita (log)	−0.17321**(0.07676)	−0.01892**	−0.01892**	0.00946**
		(0.00885)	(0.00807)	(0.00404)
Foreign direct investment inflows	−0.02881	0.01905*	0.01905*	−0.00521***
	(0.08972)	(0.00997)	(0.01031)	(0.00515)
Backward(lag)	1.24954*(0.68257)			
Constant	1.15407**	−1.25227***	−1.25227***	1.12613***
	(0.49062)	(0.28186)	(0.41946)	(0.20973)
Number of observations	252	252		
F-test	8.73985***	54.4566***		
R ²	0.60228	0.91227		
Country fixed effects	Yes	Yes		
Time fixed effects	Yes	YesYes		
Kao Residual Cointegration Test Ho: No cointegration				
t-Statistic (ADF)	−2.67052***	−2.660***		
Hausman Test Ho: difference in coefficients not systematic				
χ ² (10)	15.055***	55.086***		
Prob > χ ²	0.0046	0.0000		

Note: Standard errors are in parentheses.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

The result of the Hausman test (Table 2) rejects the null hypothesis. There is a difference between the coefficients estimated by fixed effects and random effects. Therefore, fixed effects capture better unobserved heterogeneity. The findings of the estimations are presented in Table 2.

The result of Model (1) shows that intra-regional trade is not significant in the explanation of the trade openness. The intra-community trade does not affect countries openness and therefore their

participation in international trade. Two major reasons explain the insignificance of the coefficient. The first relates to the weakness of intra-community trade. Indeed, more than 90% of trade addresses extra-community countries. The second reason concerns the nature of intra-regional trade characterized by a low value added.

However, backward integration is significant. An increase in backward integration of 1% raises trade openness by 1.31%. This result is fundamental as it highlights that foreign sources in the value chain has a major impact on the openness of economies. It demonstrates that greater integration in the value chain for ECOWAS countries can strengthen their position in international trade. Furthermore, this ratio is greater than 1 and indicates that backward integration is essential for countries to insert themselves in world trade. This result calls for a profound structural integration within the Community, meaning that intra-regional trade should further be inserted in the production of a final good that involves the maximum number of countries for the intermediate steps. Such a project at the supranational scale will require the commitment of governments and will have major effects on different countries that will accelerate the convergence and catching up. In addition, it is an opportunity for countries to engage in the implementation of a manufacturing complex and industrial networks.

We also note that other control variables have an effect on trade openness. More Per capita domestic value-added increases and more the openness degree is high which means that the more different countries of ECOWAS incorporate a large domestic value added in exported primary products, the higher is the volume of trade. In other words, countries should make efforts to integrate the maximum of local labor and capital to prevent the export of raw materials and make their goods more attractive on the international market. The level of growth in per capita GDP also negatively affects their degree of openness which suggests that the more countries develop and the less open they are to the rest of the world.

Model (2) shows the determinant of ECOWAS countries insertion to value chain measured by backward integration. The diversification in product trade has a positive effect on backward integration. Indeed, integration into the GVC is much more accessible for ECOWAS countries because of the difference between their exported products compare to the world exports. Consequently, the foreign value-added increases with the increases in diversification index. Foreign direct investment inflows have a positive significant effect on backward integration. Investments are essential in the value chain because they boost different sectors, increase economic competitiveness, improve business environments for new activities expansion. ECOWAS countries need to establish a special investment fund for industrial development and ratify sound policies to attract more foreign investment. In addition, positive changes in intra-community trade between the different sectors have a positive effect on insertion in GVCs. If intra-regional trade was insufficient to affect the openness degree (model 1), it significantly impacts backward integration. ECOWAS must create an enabling environment for the insertion in the GVC especially in the production of more-sophisticated export bundles and greater diversification of exports. This important result confirms the importance of regional integration in GVCs and also supports the stylized facts in some researches which defend that the creation of integration areas in Asia facilitated their rise in GVCs. In addition, the coefficient is greater than 1 which means that regional integration has a great potential to enable countries to better integrate into the value chain. Some factors including proximity between countries, the similarity of their level of development and cultural and historical aspects can facilitate this insertion.

The findings also show that development (GDP per capita) negatively affects the insertion in GVCs. More income levels increase and more backward integration decreases. Although the theory establishes a positive relationship between income levels and backward integration, our results are justified. Indeed, the literature (International Monetary Fund, 2015; Kowalski et al., 2015) shows that the more economies are developed, more their degree of integration in GVCs is high. However, this positive relationship is observed only when countries reach a very high GDP per capita above US \$22,000. Thus, an increase in GDP per capita in these countries leads automatically to increased backward

integration, but in countries with low GDP per capita the relationship is negative. Although the studies do not justify the negative relationship for countries with GDP per capita below US \$22,000, we can explain it by forward integration (Table 2, Forward). Indeed, developed countries have advanced technology for transforming goods with a large foreign value added. On the contrary, in developing countries, even if GDP per capita increases, they are still unable to produce goods with a large foreign value added because they do not have the adequate and necessary technology. However, this increase in per capita GDP will be depicted in forward integration with a very strong domestic value added in exports (Table 2, Forward). In the case of ECOWAS, the more economies grow, the more important will be the forward integration.

Theory shows that larger manufacturing sectors are positively related with backward participation. However, we find evidence that positive changes in manufacturing value added are associated with negative changes in the degree of backward integration. As with the case of per capita GDP, this result is justified by the fact that more the level of industrialization increases and more countries are better forward integrated (Table 2, Forward). Domestic value-added of exports increases toward sophisticated products. Furthermore, backward integration captures the demand side of value chains and forward integration captures the supply side of value chains. Therefore, the interpretation is that for ECOWAS countries a growing industrialization means a greater export capacity. This analysis is also confirmed by World Economic Forum et al. (2015). Similarity in trade has a positive effect on backward integration reflecting that an increase in trade of substitute products increases the foreign value added embodied in exports. In the case of ECOWAS, the results suggest that greater specialization leads to greater insertion in GVC.

Per capita domestic value added has a negative significant effect on backward integration suggesting that an increase in countries domestic performance reduces their foreign sourcing performance. More precisely, there is a substitution between domestic and foreign value added. The major implication for ECOWAS is that, for now, countries cannot simultaneously increase both forms of participation (backward and forward) in GVCs. Finally, an increase in the weighted tariff rate applied in all products contributes to improve countries backward integration which means that local industries and manufacturers need to be protected from foreign industry. An implementation of regional value chain among ECOWAS countries requires to fix a tariff rate to address the high competitiveness of foreign suppliers. This can be a smart barrier.

5. Concluding remarks

International trade and regional integration remain captivating hot topics of interest to countries because they constitute a powerful weapon of domination. Although trade in value chains have emerged in the early 2000s and has rapidly developed, empirical works are still missing: the links, the connections and the various implications in the value chain being not well perceived. This research examines the regional integration within the ECOWAS by discussing the role of an integration into the value chain on international trade. The study also identifies the determinants affecting the participation of ECOWAS countries in Global Value. Although consensus is established on the positive effects of openness (Foster, 2008), the literature is divided on the choice of strategies. The results show very interesting insight as to the extent of the potential of regional integration and GVCs insertion among ECOWAS countries.

Our findings show that intra-regional trade is not significant in the explanation of trade openness but an increase in backward integration raises trade openness. Backward integration can be a powerful instrument for countries to strongly insert themselves in world trade. Furthermore, the degree of sophistication in the products allows countries to have a better impact on trade. A better diversification in products increases the insertion in GVC. An increase in foreign direct investment inflows and positive changes in intra-community trade are linked positively with a growing backward participation. However, the level of development negatively affects the insertion in GVCs suggesting the existence of a wealth threshold beyond which the effect of the per capita GDP on backward integration becomes positive. Positive changes in industrialization (manufacturing value added) and per

capita domestic value added are associated with negative changes in the degree of backward integration, suggesting that there is a substitution between domestic and foreign value added. Therefore, ECOWAS countries cannot simultaneously increase both forms of participation (backward and forward) in GVCs.

In sum, ECOWAS integration can further be inserted in a regional value chains for the production of final goods which involves the maximum number of countries for the intermediate steps. To achieve this structural integration the tariffs rate is crucial to help intra-community actors to protect themselves against foreign suppliers. This will intensify trade within the Community.

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Notes

1. UNCTAD data (2016).
2. Noguera (2012) and Choi (2013) model is the most advanced gravity model which incorporates global input-output data in an international trade model through which value-added travels in the form of intermediate inputs in its journey from the source to the destination.

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