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THE ROLE OF SPECIALIZATION IN ENHANCING ECONOMIC COMPETITIVENESS: AN EMPIRICAL ANALYSIS OF SUB-SAHARAN AFRICA

ABSTRACT

This paper contributes to the literature on the role of specialization in economic competitiveness. To this end, it evaluates the effects of specialization on the competitiveness of the economy of 28 countries in sub-Saharan Africa (SSA) over the period from 2007 to 2018 using the system generalized method of moments (GMM) and the random effects method. It is found that specialization in manufactured goods, oil products and high technology has a positive effect on economic competitiveness, while specialization in agricultural raw materials and commodities has a negative effect. Also, the structure of specialization similarly affects the economic competitiveness of Central Africa, East Africa and West Africa, but varies slightly with those of SSA member countries belonging to South Africa. In addition to producing and exporting goods in which they have a comparative advantage, SSA countries need to strengthen bilateral cooperation to improve their value chains and benefit from competitiveness gains.

Keywords: specialization, economic competitiveness, effects, Sub-Saharan African

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INTRODUCTION

For an economy, being able to respond well to global demand is undoubtedly a factor of competitiveness. In the literature, global competitiveness is defined as the ability of an economy to create and maintain an environment that supports the creation of more wealth for the economy and more prosperity for the population (Krugman, 1994). It provides a detailed map of the factors and attributes that determine productivity, growth and human development. Consequently, it corresponds to the propensity with which an economy ensures the success of its enterprises while improving the well-being of its inhabitants in the long term, in an increasingly interdependent world. From this perspective, authors such as Dejardin (2006) and Grossman and Helpman (1991) show that competitiveness does not depend solely on prices, but can also be based on other strategic variables, notably international specialization.

In the theory of international trade, specialization plays a prominent role and is often associated with growth, competitiveness and economic stability. Since Adam Smith and David Ricardo, many authors have defined the basis of trade according to this concept, emphasizing the mutual benefit that results at each moment for each partner country. International specialization is defined as the difference between the structures of a country's exports and its imports, or the difference between the structures of production and absorption. Thus, it represents the concentration of a country's production in particular industries or products. Changes in this specialization can result from changes in the structure of the productive equipment, from transformations in the structure of intermediate and final consumption or investment, or from the effect of economic reforms. On this subject, Young (1991) shows that international specialization is an important factor in economic competitiveness, since it could contribute to improving the capacity of an economy to impose itself on the world market, thanks in particular to substantial market shares.

This article is in alignment with an extension of this work in the context of Sub-Saharan Africa (SSA). Indeed, in recent decades, SSA countries have been characterized by poor export performance, which has slowed down their global economic integration. While developed countries have recorded an increase in inter-regional trade and an expansion of trade with the rest of the world, SSA's share of world trade remains low. For these countries, the contribution of exports to their GDP has remained lower than in developed countries. Over the period 2000-2020, the evolution of the share of exports in GDP was -1.9% for

SSA, compared to 0.59% for East Asia and the Pacific, -0.58% for North America, 1.35% for the European Union, 0.93% for Latin America and the Caribbean, and 0.58% at the global level (World Bank, 2022). With regard to the evolution of world market share, SSA has underperformed. Indeed, with a contribution of 1.83% to world exports in 2000, the Region recorded a decline in its share in 2020 to 1.61%. These statistics suggest that with economic integration, SSA failed to improve its market share and ensure the welfare associated with increased trade. Thus, the zone appears to be the least integrated in international trade. Behind this stagnation at the aggregate level, these overall findings cannot account for the disparities that exist in terms of the direction of specialization.

Based on these findings, this paper examines the effect of specialization on the competitiveness of SSA countries over the period from 2007 to 2018. Based on endogenous growth theory (Barro, 1990; Barro and Sala-i Martin, 1992), it is hypothesized that international specialization is a key determinant of the competitiveness of SSA economies. This theoretical framework considers that the link between specialization and competitiveness is the result of comparative advantages that no longer stem from exogenous factor endowments but from the cumulative effects of changes in techniques, renewal of product quality and economies of scale. This hypothesis is tested by two techniques. First, a GMM estimation is applied to the Global Competitiveness Index (GCI) by considering the relative specialization index of Krugman (1991). Since it is difficult to know to what extent the use of one specialization index rather than another affects the results obtained, we secondly use Balassa's (1965) revealed comparative advantage ratio to decompose the effect of the specialization structure on economic competitiveness.

The contribution of the article is twofold. First, it provides a contribution from the literature concerning the choice of the dependent variable. Indeed, most studies have analyzed the effects of specialization on economic growth. In the current global context, marked by increasing competition, the challenge facing countries is that of economic competitiveness. However, as Krugman (1994) has pointed out, a competitive economy is a growing economy, but economic growth does not necessarily lead to competitiveness at the macroeconomic level if the latter does not benefit the population. Thus, this article makes a contribution in this sense. The second contribution is an empirical one, based on the place of SSA countries in international trade.

In addition, we present in the second section a review of the literature on the effects of specialization on the economy. The third section presents the methodological approach

adopted for the analysis. The fourth section presents and discusses the results. The fifth section concludes the research by highlighting the policy implications of the main results.

LITERATURE REVIEW

In this section, we review the theoretical and empirical literature on the relationship between specialization and economic competitiveness

Theoretical basis

A review of the theoretical literature reveals that since the theory of absolute advantage developed by Smith (1776), the notion of specialization has been at the core of international trade theory. In this founding model, countries are willing in trading and opening up to trade only if they have an absolute advantage. This theory was considered too restrictive because it condemned countries without absolute advantages to remain in autarky. Thus, Ricardo (1817) completed Smith's model (1776) by introducing the concept of comparative advantage. According to this model, countries must specialize in the production for which they have the highest productivity, compared to their trading partners. Following these theories, the new theories of international trade introduce product differentiation and economies of scale to understand trade and specialization. However, the novelty is very relative insofar as this new theory actually extends older work that also aimed to explain the characteristics of contemporary international trade.

The theoretical literature on specialization and growth suggests two main channels through which specialization can affect the competitiveness of the economy. The first comes from Ricardian theory. In this channel, specialization generates competitiveness through the optimization of economic resources. In this sense, trade benefits all participating countries, since it allows consumers to benefit from more competitive products in terms of both price and structural competitiveness by taking advantage of the comparative advantages of all countries.

The second channel comes from the endogenous growth model (Barro, 1990 ; Barro and Sala-i Martin, 1992). In this case, the link between specialization and competitiveness stems from comparative advantages that are no longer allocated to countries by exogenous endowments of factors of production, but are produced by cumulative effects related to changes in techniques, the renewal of product quality and economies of scale. These cumulative effects can have a positive or negative impact on competitiveness depending on

whether the country acquires a "good or bad specialization structure" (Murshed and Serino, 2011).

Ultimately, these theories provide insight into how specialization affects competitiveness, either through exogenous or endogenous endowment of production factors. This article falls into the second channel to assess the effect of specialization on competitiveness. Thus, the determination of international specialization can be a source of gain in international trade, leading to advantages greater than those resulting from their pre-trade situation.

Empirical literature

Since the theories of absolute and comparative advantage, specialization has become the subject of empirical analysis (Lafay, 1981). Thus, several analyses consider that competitiveness, a key factor in economic integration, does not depend solely on prices but can also be based on other strategic variables such as specialization (Chiappini, 2011).

Lafay (1979) was the first to establish that specialization generates economic competitiveness. For him, a country's specialization is a structuring component of competitiveness since it reflects its ability to adapt to changes in global demand. Consequently, a country's specialization is capable of stimulating or weakening the economy's performance on the international market. Indeed, if a country specializes in the areas where global demand is strongest (or weakest), its competitiveness will increase (or decrease). Similarly, Jarreau and Poncet (2009), using the dynamic panel GMM method, studied the impact of export sophistication on the economic performance of Chinese provinces over the period 1997-2007. They find that regions that engage in the process of developing the production of more sophisticated goods, obtain larger trade gains, and grow their market shares faster. Through these results, the authors indicate that these gains result from the activities of specialized domestic firms.

Following the same logic, Tamberi (2006), in his work on specialization and growth prospects in the South Mediterranean, established that specialization should be analyzed as a set of different goods that are efficiently traded by a specific area. Using a semi-parametric estimation of three different indices of aggregate specialization, the author made a GMM estimation that reveals that aggregate specialization decreases with increasing per capita income and size of the economy (country-specific effects are also taken into account).

Ons (2017), to study the impact of specialization on growth in emerging countries and compare it to that of developed and developing ones, used the dynamic panel GMM

method on a sample of 109 countries after measuring their respective degrees of specialization. The author finds a positive impact of specialization in high technology on growth regardless of the type of country. However, the impact of specialization in labor-intensive and resource-based manufactures depends on the level of development of the country. It is positive for emerging countries and negative for developed countries. For the author, this difference is essentially due to the variation between countries in the importance of the endowment of unskilled labor at relatively low cost.

Regarding the effect of the structure of specialization, Tapia (2012) shows that the degree and sectors of specialization of a country have a very significant impact on the structural competitiveness of a country. For him, the most vulnerable countries are essentially those that specialize in risky sectors. This conclusion is shared by authors such as Krishna and Levchenko (2013) a risky sector is a sector that contains low complexity products. In this regard, Kabore (2021) argues that there is a consensus in the literature that African countries in general tend to specialize in the production and export of basic primary products, with unsophisticated materials, which make them vulnerable on the global market.

In summary, the literature shows that specialization improves the competitiveness of economies, but that this relationship is strongly affected by the structure and risk of specialization, especially in developing countries. If specialization is operated in a risky sector, it may be a source of instability and therefore not contribute to economic competitiveness. This research aims primarily to analyze this relationship in the case of SSA countries.

METHODOLOGICAL APPROACH

Specification of the econometric model

A review of the literature reveals the absence of a theoretical anchor defining economic competitiveness (Bellone and Chiappini, 2016). For these authors, even if the theory of gains linked to international openness could explain a nation's competitiveness, the difficulty comes from the fact that these advantages are complex and can only be understood in their entirety by decompartmentalization of the traditional fields of analysis. Thus, the model that is used in this article is inspired by Ons (2017). It is presented as follows:

$$Compt_{it} = \eta_i + \rho Spec_{it} + \beta CV_{it} + \varepsilon_{it} \quad (1)$$

In equation (1) $Compt_{it}$ is the country's level of competitiveness, $Spec_{it}$ represents specialization, CV_{it} is the vector of control variables, ρ and β are the marginal effects related to the variables, ε_{it} is the error term, i and t represent the country and time respectively, η_i represents the country-specific effect. It captures the effect of unobserved country-specific factors that affect the competitiveness of the economy. For the evaluation of the effect of the structure of specialization on economic competitiveness, the variable $Spec_{it}$ is replaced by the Revealed Comparative Advantage Ratio $(RCAR_{itk})$. This transformation allows us to take into account the seven sectors of specialization presented in the World Bank's development indicators. Thus, we obtain :

$$Comp_{it} = \eta_i + \rho RCAR_{itk} + \beta CV_{it} + \varepsilon_{it} \quad (2)$$

In equation (2), $RCAR_{itk}$ represents the specialization in sector of country i in period t with $k = 1, 2, ..., 7$. It is important to note that for each k, we have a model to estimate, i.e. 7 models in total.

Variables and data sources

In this work, the endogenous variable is economic competitiveness. Many international organizations and institutions establish and disseminate summary indicators aiming to rank the different countries according to multiple criteria, including economic competitiveness. Economists use several indicators in this area, but each indicator is established according to the focus of the study. Of all the indicators in the literature, the Global Competitiveness Index (GCI) of the World Economic Forum (WEF)[1] remains the most comprehensive in that it takes into account all sectors as well as the well-being of the population. As a result, this article has selected it.

The variable of interest is specialization. It can be the result of policy orientation and/or factor endowments (essentially natural resource endowments). In terms of measuring the degree of specialization, the empirical literature presents several indicators. On the one hand, there are relative indicators such as the Herfindahl-Hirschman index[2], which measures the shares of economic sectors in the total exports of the concerned

1 See World Economic Forum (2020) for more details

2 See Biggar (2004) for more details

country. On the other hand, the Krugman index highlights the share of employment in the country's production structure, and indices relating to foreign trade, such as the Balassa index, which measures the share of a country's exports in the country's various economic sectors. Thus, specialization can be considered in both aggregate and disaggregated states.

Specialization in the global state

Generally, sectoral specialization indices are used to measure the specialization of countries, but they do not provide an indication of the overall specificity of countries. To remedy this, Dupuch and Mazier (2022) suggest the use of the Krugman Specialization Index (KSI). The Krugman Index is the sum of the absolute differences between the industrial structure of a country and that of the rest of the world. It is calculated from the employment structure of a country in relation to that of its partners.

$$KSI = \sum_i \left| E_i - E_i^* \right|$$

Where E_i is the country's share of total employment in the sector i and E_i^* is the share of employment in the area as a whole in the same sector. The KSI is interpreted as the sum of the absolute divergences of a country's specificity index from the unit, i.e. a situation where the country has the same share of employment as the area as a whole. This sum is weighted by the importance of the sector i, measured by the relative share of employment of the sector i in the rest of the zone. As a result, we obtain a synthetic index of the specificity of the country in relation to the rest of the zone. It is accepted that $0 < KSI \leq 1$. Thus, if the index is close to 0 the two areas will be very similar in their industrial structure, otherwise the structure is different.

Specialization in a fragmented state

To assess the effect of the structure of specialization on the economy, we use, in the light of Crafts and Thomas (1986) and Dalum, et al. (1998), Balassa's (1965) Revealed Comparative Advantage Ratio $(RCAR)$. This is an index of foreign trade obtained by dividing the export share of sector i in country j by the sector's share in the world. This index, interpreted as an indicator of contribution to the trade balance, is generally used in non-comparative analyses. This is why it is used in this article. The $RCAR$ is defined as follows :

$$RCAR_{ij} = \frac{ACR_{ij} - 1}{ACR_{ij} + 1}$$

With

$$ACR_{ij} = \frac{\frac{x_{ij}}{\sum_{i} x_{ij}}}{\frac{\sum_{j} x_{ij}}{\sum_{i}\sum_{j} x_{ij}}}$$

In the RCAR equation, x_{ij} represents country j's exports in industry i; $\sum_{i} x_{ij}$ the sum of country j's exports; $\sum_{j} x_{ij}$ the world exports in industry i; $\sum_{i}\sum_{j} x_{ij}$ the world exports in all industries.

Since the RCAR is used to assess the structure of specialization, it is important to present its general structure. Thus, to take into account the entire structure of exports of SSA countries, we retain seven (07) areas of specialization following the retained export sectors of the World Bank's WDI. These are : Specialization in Information and Communication Technology (ICT) ; Specialization in manufactured goods ; Specialization in petroleum products ; Specialization in high technology ; Specialization in agricultural raw materials ; Specialization in ores and precious metals ; Specialization in commodities.

The control variables are :

Initial competitiveness. It is indicated that the level of previous competitiveness of a country could have positive effects on future competitiveness. Thus, it is used as an instrument of competitiveness since, as Porter (1990) admitted, competitiveness is not inherited, but is built over time. A positive sign is expected.

Investment is captured by gross fixed capital formation. It measures the accumulation of physical capital by the country. A high investment rate promotes growth. A positive sign is expected.

The human capital stock is often approximated by the secondary school enrollment rate. Due to the lack of data for the majority of SSA countries over the selected period, we use life expectancy at birth as a proxy for human capital as proposed by Sala-I-Martin (1997).

A strengthening of human capital is likely to lead to a gain in economic competitiveness. A positive sign is expected.

Economic openness measures the volume of trade with the rest of the world in relation to GDP. It captures the intensity of trade interactions with the rest of the world. Its sign is ambiguous, because while exports can have a positive effect on competitiveness, imports can have negative ones.

Financial development is measured by two categories of indicators. First, there are indicators relating to the size and efficiency of bank activity and second, there are others relating to the functioning of financial markets. Because of the low level of financial market development in developing countries in general, it is more appropriate to use the first category. Like King and Levine (1993), credit to the private sector as a percentage of (GDP) is used as an indicator of financial development in this work. Thus, more credit for economic units is a factor in enhancing economic competitiveness. The expected sign is positive.

Political stability and control of corruption are two variables of institutional quality. A higher quality of institutions is likely to ensure a better use of resources and thus guarantee competitiveness of the economy. Positive signs are expected.

The data used in this paper are annual and cover the period from 2007 to 2018 for 28 SSA countries. The choice of the study period and the list of countries is explained by the availability of data, especially those on the GCI. The data are taken from the World Bank database (World Development Indicators, 2022) except for GCI, which is taken from the World Economic Forum, and political stability and control of corruption, which are retrieved from the World Bank's Worldwide Governance Indicators database (2022).

Table 1. Description of variables

Variable	Mean	Standard deviation	Min	Max
GCI	3.619048	0.4165892	2.1	4.5
ISK	0.0000396	0.0000379	1.10e-06	0.0002287
SPTIC	0.0581361	0.1472436	1.28e-06	1.710443
SPBMANU	0.3233701	0.3070208	1.07e-06	1.390031
SPCAR	0.9700328	1.638376	7.41e-08	9.369202
SPHTEC	0.262163	0.2215193	0.000156	1.491276
SPMABA	5.541765	8.018946	0.0000124	44.10603
SPMMPR	3.346236	4.681474	0.0000223	21.97264
SPPROBA	4.310174	2.965937	0.181189	13.97131
STPO	-0.3538515	0.8225615	-2.211123	1.838058
CCORUP	-0.3737863	0.6038886	-1.500625	1.039068
FBCF	22.59482	7.608292	3.28591	46.73224
OUEC	0.6400991	0.2704585	0.1934555	1.427811
CH	59.81748	6.224523	42.854	74.51463
DEVFIN	29.75561	27.37949	3.61349	130.5454

Source : Author, based on World Bank data (2022)

The table presents the descriptive statistics of the different variables selected. For the Global Competitiveness Index (GCI), the values vary between 2.1 and 4.5, with a mean of 3.62 and a standard deviation of 0.42. This indicates that the competitiveness of the different countries in the sample is very low in terms of volatility. The global specialization index varies between 1.10e-06 and 2.29e-05. It has a mean of 0.0000396 and a standard deviation close to 0 (0.0000379). This shows that the different countries have almost the same industrial structure.

Method of estimation

The effect of specialization on economic competitiveness is evaluated using the generalized method of moments (GMM) in a dynamic panel. The choice of this method is linked to the fact that the number of individuals (28) exceeds that of the period (12).

Indeed, in the case of dynamic panels, to deal with the problem of endogeneity of the variables, the estimator of the method of generalized moments in the first difference of Arellano and Bond (1991) is most often used. However, the properties of this estimator are weak when the variables are highly persistent. In this case, the level lagged variable is weakly correlated with the first difference equations (weak instrument). Under these conditions, Blundell and Bond (1998) show that the system generalized method of

moments estimator is more appropriate. The system GMM consists in combining for each period the first difference equations with the level equations in which the variables are instrumented by their first differences. Thus, the latter authors suggest differentiating the instruments instead of the regressors to make them exogenous to the fixed effects. We then move from a difference estimator to a system estimator. This method also allows the introduction of more instruments. It is particularly well suited to dynamic panels because it allows us to take into account any potential correlation between the explanatory variables and the country-specific factors. It is a method that does not require external instruments because it uses lagged variables to correct for endogeneity bias.

RESULTS AND DISCUSSION

In this section, we present the empirical results of the estimates and discussions, but before that, we present the results of three important tests for the panel time series.

Preliminary tests

This section deals with specification, dependence and stationarity tests.

Specification test

When working on a sample of panel data, the first test that should be done is to check the homogeneous or heterogeneous specification of the data generating process. The result of the specification test gave a Fisher statistic of F (27. 301) = 13.27 and P-value = 0.0000. At the 5% threshold, this empirical evidence allows us to reject the null hypothesis of no individual effects. We therefore conclude that the data support the selected panel structure.

Dependency test

To choose between the first or second generation stationarity tests, we perform the Pesaran (2004) test of inter-individual independence. The test result gave a statistic of -0.057 and a P-value = 0.9542. This result allows us to conclude that there is autocorrelation at the 1% threshold and to carry out the stationarity test of the series using the first generation tests, i.e. the Levin-Lin-Chu (1993) (LLC) and Im, Pesaran and Shin (2003) (IPS) tests which are the most widely used in this case. They are based on the null hypothesis of unit root existence.

Stationarity test

The results of the two tests (in Appendix 1) reveal that at the 5% threshold, only competitiveness, political stability and control of corruption are stationary in level. These variables are therefore integrated of order 0 (I (0)) for both tests. The other variables are stationary in first difference; these variables are integrated of order 1 (I (1)).

Presentation and discussion of estimation results

In this section, we present the estimation results. First, a first system GMM estimation presents the effect of specialization on economic competitiveness. Then, a second system GMM estimation shows the effects of the structure of specialization on economic competitiveness. Finally, a third estimation focuses on the effects of the structure of specialization on economic competitiveness by considering four (04) zones composing the global sample. For the latter, the estimation is carried out using the random effects method.

The Sargan and Hansen over-identification tests did not reject the null hypothesis of the validity of lagged competitiveness as an instrument in the first two estimates. Also, it is important to note that Arellano and Bond's autocorrelation tests validate an absence of second degree autocorrelation in both situations. For the random effects estimation, the coefficients "rho" measure the share of variance imputed to individuals and the two indicators "sigma_u" and "sigma_e" indicate the relative magnitude of the components of the overall error in level 1 and level 2 error.

Effect of specialization on economic competitiveness

Table 2 presents the estimation results of the effect of specialization on economic competitiveness.

Table 2. Results of the estimation of the effect of specialization on competitiveness

Variables	Effect on economic competitiveness
Delayed value of competitiveness	0.236** (2.34)
Global specialization	0.225** (2.03)
Political stability	0.0657* (1.65)
Control of corruption	0.193*** (2.72)
Gross fixed capital formation	-0.000647 (-0.15)
Economic opening	-0.250** (-2.05)
Human capital	0.00870* (1.70)
Financial development	0.00343*** (2.99)
Constant	2.399*** (6.39)
A-R (1) p-value	-3.64 (0.0000)
A-R (2) p-value	1.61 (0.107)
Sargan (P-value)	16.38 (0.174)
Hansen (P-value)	14.85 (0.250)
Observations	335
Country	28

Notes: (1) values in parentheses are t-statistics; (2) *** significant at 1%, ** significant at 5%, *significant at 10%. Source: Author, based on World Bank data

This estimate shows that specialization has a positive and significant effect of 0.225 on the competitiveness of the SSA economy. This means that an improvement in specialization of one unit contributes to strengthening the competitiveness of SSA countries by 0.225 units. This result shows that when these countries specialize in areas in which they have a comparative advantage, this allows them to build a productive structure that is efficient and competitive in the global market. These results are consistent with those obtained by Finicelli et al (2010); Lee (2011) and Jarreau and Poncet (2012). Indeed, these authors were

able to establish that in the context of international economic openness, specialization is a crucial factor in the external performance of economies.

It should be noted that the instrument represented by lagged competitiveness has a positive and significant coefficient. This result confirms Porter's (1990) statement that the competitiveness of an economy in a given period depends on its level in the previous period. Thus, competitiveness is not inherited, but is built up over time. With regard to the control variables, it emerges that political stability, control of corruption, human capital and financial development have a positive and significant influence on the competitiveness of the SSA economy. Thus, greater political stability, good control of corruption, improved quality of human capital, and financial development are factors that boost economic performance and hence competitiveness. The results show, however, that economic openness significantly and negatively affects economic competitiveness. For the World Economic Forum (2017), developing countries in Africa in general have been suffering for several decades, from a lack of competitiveness at the regional and international levels. In light of Verner (2015), economic openness only benefits those economies that are able to compete in the global market with competitive products. Therefore, as the latter are weakly competitive and taking into account the increasing competition, this result is explained by the fact that economic openness does not allow them to impose themselves on the global market hence the negative sign.

Despite the positive impact of specialization on economic competitiveness, this result does not enable us to understand the areas in which countries should specialize. To do this, we study the effects of the specialization map on competitiveness through the results in Table 3.

Effect of specialization structure on economic competitiveness

Table 3 presents the results of the estimation of seven (07) models, each corresponding to a domain of specialization. All the models were estimated from the GMM in system.

Table 3. Results of the estimation of the structure of specialization on economic competitiveness

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Delayed value of competitiveness	0.230** (2.28)	0.204** (2.12)	0.223** (2.22)	0.24** (2.38)	0.232** (2.31)	0.2325** (2.29)	0.22815** (2.27)
Specialization in ICT	0.0709 (0.73)						
Specialization in manufactured goods		0.294*** (2.99)					
Specialization in petroleum products			0.0267* (1.93)				
Specialization in high technology				0.1798*** (2.86)			
Specialization in raw agricultural materials					-0.0051*** (-3.04)		
Specialization in ores and precious metals						-0.000891 (-0.23)	
Specialization in commodities							-0.0153** (-2.09)
Political stability	0.0662* (1.65)	0.0542 (1.41)	0.0815** (2.05)	0.0721* (1.81)	0.0682* (1.68)	0.06828* (1.80)	0.06256* (1.68)
Control of corruption	0.193*** (2.70)	0.174** (2.45)	0.2011*** (2.72)	0.1815*** (2.62)	0.1823** (2.64)	0.19039*** (2.67)	0.21253*** (3.04)
Gross fixed capital formation	-0.00084 (-0.20)	-0.0014 (-0.32)	-0.000756 (-0.17)	-0.00122 (-0.31)	-0.000341 (-0.08)	-0.000678 (-0.16)	-0.00125 (-0.28)
Economic opening	-0.256** (-2.05)	-0.303*** (-2.77)	-0.261** (-1.98)	-0.2473** (-1.97)	-0.2545** (-1.96)	-0.25034** (-2.07)	-0.2837** (-2.39)
Human capital	0.00865* (1.71)	.0065 (1.26)	0.0097** (1.96)	0.0089* (1.75)	0.00814 (1.62)	0.00866* (1.71)	0.00992** (1.97)
Financial development	0.00347*** (3.09)	0.0034*** (3.03)	0.0032*** (2.89)	0.00371*** (3.39)	0.00341*** (3.07)	0.003498*** (3.09)	0.00325*** (2.95)
Constant	2.440*** (6.48)	2.609*** (7.17)	2.397*** (6.63)	2.338*** (6.26)	2.483*** (6.63)	2.429458*** (6.28)	2.47996** (6.43)
A-R (1)(p-value)	-3.64(0.000)	-3.51(0.000)	-3.69(0.000)	-3.63(0.000)	-3.63(0.000)	-3.65(0.000)	-3.50(0.000)
A-R (2) (p-value)	1.74(0.081)	1.81(0.07)	1.81(0.07)	1.85(0.065)	1.77(0.076)	1.76(0.079)	1.76(0.079)
Sargan (P-value)	14.81(0.252)	17.06 (0.147)	16.25(0.18)	13.95(0.304)	16.3(0.178)	15.17(0.232)	15.92(0.195)
Hansen (P-value)	15.39(0.221)	17.82(0.121)	14.79(0.253)	11.59(0.479)	16.34(0.176)	15.19(0.231)	15.17(0.232)
Observations	335	335	335	335	335	335	335
Country	28	28	28	28	28	28	28

Notes : (1) values in parentheses are t-statistics ; (2) *** significant at 1%, ** significant at 5%, *significant at 10%.
Source : Author, based on World Bank data (2022).

The results of the estimation of the seven models show that specialization in manufactured goods, petroleum products, and high-tech goods positively and significantly affects economic competitiveness, whereas specialization in raw agricultural materials and commodities has negative effects.

For SSA countries, specialization in the production of manufactured goods, petroleum products and high-tech goods is favorable in gaining economic competitiveness. For these countries, specialization in manufactured goods leads to an improvement in world market share, which varies greatly depending on the quality of the products. It is also important to note that these countries gain market share when they specialize in the high-value portions of the trade structure. Thus, specialization in manufactured goods, which has long been considered the prerogative of developed countries, is a factor in strengthening the competitiveness of developing countries in SSA. This conclusion confirms that of Fontagné et al (2008), for whom specialization in the production of manufactured goods is a source of economic performance and that the difference in specialization in manufactured goods between developed and developing countries is becoming less marked. In addition, it should be noted that the effect obtained (0.29) is lower than that obtained for emerging countries (4.95) by Ons (2017). This result implies that the manufactured goods sector, despite the positive contribution to competitiveness, remains underperforming. For Kabore (2021), SSA will not be a major exporter of manufactured goods because it does not have the necessary skills.

With respect to specialization in petroleum products, the positive effect reflects the fact that when SSA countries concentrate more on the production of petroleum products, this provides them with a competitive edge on the world market. Specifically, the development of the oil sector in SSA is particularly important because many of the major companies have been present there for decades. In addition, SSA offers a number of significant comparative advantages that make it a preferred location for these large companies, including very favorable tax and operating contract terms. This result is similar to that of Favennec and Copinschi (2003), for whom the exploitation of petroleum products constitutes an important asset for strengthening the economic structure and hence the competitiveness of SSA economies.

It is also recognized from the results that specialization in high technology is conducive to increased economic competitiveness. It is important to emphasize that even if SSA countries specialize in high technology, this sector is essentially based on technology transfers from developed countries alone. Access to this technology can reach its limits,

especially as emerging countries are formidable competitors for developing economies. Since developed countries are less inclined to admit these knowledge transfers, the effect of high technology is weak and could fade over time. Moreover, Feenstra and Wei (2010) had reached this conclusion before Ons (2017) found that the effect of high-tech specialization on economic growth is 0.88 for emerging countries versus 0.11 for developing countries. Our result is consistent with these findings as we have an effect of 0.17 significantly lower than that of developing countries.

Specialization in raw agricultural materials negatively and significantly affects economic competitiveness. This result could be explained by the fact that agricultural equipment is still extremely rudimentary. These results are consistent with those obtained by Blattman et al. (2005), Hausmann et al. (2006) and Herrera and Ilboudo (2012). They also corroborate the result of Kabore (2021) who, after estimating a neoclassical model at the aggregate factor level under production specialization in SSA, obtains a negative effect of agricultural capital stock.

Commodity specialization has a negative effect on the competitiveness of SSA economies. This result confirms Wood's (1995) finding that, in general, Africa exports a lot of primary products, which, moreover, are highly intensive in unskilled labor. Indeed, commodities (essentially primary products) are a key component of the economies of most developing countries. In SSA, countries concentrate their exports on primary commodities (Kabore, 2021). More than 80% of countries depend on the export of primary commodities. This production is highly ubiquitous, as these primary commodities are produced by a large number of countries. This dependence on commodities, in conjunction with other factors, is a source of vulnerability and a definite handicap for the economic competitiveness of these countries. Because of the weakness of the commodity production structure in SSA, these countries have little ability to compete with technologically advanced developed countries in the production of this category of products. This result confirms those of Hausmann and Hidalgo (2011), Tapia (2012) and Krishna and Levchenko (2013). Indeed, for these first authors, the production structure in developing countries does not allow them to compete in the global market with competitive commodities due to their high ubiquity. They stipulate that the high ubiquity of commodities in developing countries makes them less complex to produce and therefore a sector at risk of specialization.

The ICT and precious metals and minerals specialization variables are insignificant. ICTs are expected to improve economic competitiveness because of their effect in reducing

transaction costs and the risks that firms incur. The insignificance probably reflects the fact that there is a minimum level of development at which ICTs begin to have a significant effect on economic competitiveness. With respect to minerals and precious metals, SSA is endowed with immense mineral resources and precious metals. According to Sachs and Warner's (1999) big push theory, mining and precious metals should have a positive effect on economic competitiveness in developing countries since it provides financial resources to strengthen economic infrastructure and human capital. The non-significance of this variable could be explained by the Dutch disease. Indeed, the Dutch disease describes the perverse effects of rent dependency on an economy. It refers to the effect of a sharp rise in export earnings, the movement of factors of production from other sectors of the economy to a booming extractive industry, which can lead to deindustrialization, and an appreciation of the national currency that makes non-resource-dependent sectors less competitive.

Effects of the structure of specialization on economic competitiveness according to the four zones in the overall sample

To test the robustness of the results, we extracted four (04) cylindrical panels from the overall sample according to the geographical location of the countries. To do this, the countries in the sample were grouped into four zones (Appendix 2). Since the sample is small, the condition for using the GMM no longer holds. The fixed-effects model and the random-effects model each have their own specificities that are relevant for different data. The conclusions of the Hausman test give a P-value of 0.996. At the 5% threshold, the null hypothesis of the presence of random effects is not rejected. This empirical evidence allowed the use of the random effects model for two reasons. First, the time dimension of the four panels is quite high compared to the individual dimension and second, we have relevant variables in the literature that are time invariant. The estimation results are reported in Table 4.

Table 4. Results of the estimates obtained on the sample of countries in these different sub-regions

Variables	Zone1	Zone 2	Zone 3	Zone 4
Specialization in ICT	0.0968117 (0.12)	0.6379702 (1.15)	0.0396735 (0.27)	0.3704546 (0.24)
Specialization in manufactured goods	0.622389** (2.36)	0.1123679** (2.05)	0.511406*** (5.60	0.2036083* (1.81)
Specialization in petroleum products	-0.015301 (-0.13)	-0.0080175 (-0.14)	0.0029022 (0.77)	-0.0664047 (-0.43)
Specialization in high technology	0.2096671*** (3.91)	0.2135849** (2.13)	0.2042591*** (2.72)	0.0462833** (2.46)
Specialization in raw agricultural materials	-0.0078183** (-1.98)	-0.0036345 (-0.73)	0.068408*** (3.47)	-0.011727*** (-2.74)
Specialization in ores and precious metals	-0.084534*** (-2.71)	0.0057019 (0.38)	-0.0139355** (-2.31)	-0.0162865 (1.60)
Specialization in commodities	0.206863 (0.90)	0.0005597 (0.12)	0.0280145** (2.51)	0.0025724 (0.23)
Political stability	0.2154877** (2.37)	0.0804724*** (2.59)	0.1929023*** (3.72)	0.1427177*** (3.31)
Control of corruption	0.1525176 (1.30)	0.190901** (2.27)	0.1556845** (1.96)	0.1837921** (2.21)
Gross fixed capital formation	-0.0010382 (-0.10)	-0.0013821 (-0.29)	0.0043317 (1.02)	-0.0029393 (-1.06)
Economic opening	-0.908057*** (-3.62)	-0.5483818** (-2.12)	-0.119876*** (-2.71)	-0.2417354** (-2.32)
Human capital	0.0170152 (1.31)	0.0258868*** (6.15)	0.0204058*** (4.53)	0.0014815** (1.98)
Financial development	0.0059359*** (3.05)	0.0089087*** (4.18)	0.007023*** (8.40)	0.0047511** (5.00)
Constant	2.51191*** (2.82)	2.10272*** (5.62)	1.469729*** (5.01)	3.709923*** (11.06)
sigma_u	0.24468965	0.24493078	0.35196984	0.31328872
sigma_e	0.12694375	0.17378094	0.17808823	0.24300701
rho	0.78793007	0.66515674	0.79617104	0.62435387
Observations	36	84	96	120
Country	3	7	8	10

Notes : (1) values in parentheses are t-statistics
(2) *** significant at 1%, ** significant at 5%, *significant at 10%
Source : Author, based on World Bank data (2022)

The estimation results obtained on the country subsamples show that the effects of specialization in its various components appear to be similar for zones 1 (composed of Central African SSA countries), 2 (composed of East African SSA countries), and 4 (composed of West African SSA countries) but vary slightly with those of zone 3 (composed of South African SSA countries). More specifically, among the variables, specialization in manufactured goods, specialization in high technology, specialization in agricultural raw materials, specialization in precious metals and minerals, and specialization in commodities are factors that significantly affect economic competitiveness. The first two variables have positive effects, while the last three affect competitiveness negatively. These results could be explained by regional heterogeneity in terms of production and export structure. Indeed, the East and South African regions export on average the most sophisticated products, while Central and West Africa have the lowest average level of sophistication.

CONCLUSION AND AND IMPLICATIONS

This research contributes to the literature on the economic effects of specialization. Indeed, it examines the effects of specialization on the economic competitiveness of 28 sub-Saharan African countries over the period from 2007 to 2018. For this purpose, three estimates were made. In the first two, specialization is considered in a global way and then in a structured way and the estimation is relayed by the generalized method of moments (GMM) in the system of Blundell and Bond (1998). In the last estimation, the SSA is segmented into four zones and the estimation is performed using the random effects method. The article is based on endogenous growth theory, which states that the link between specialization and competitiveness results from comparative advantages that are no longer allocated to countries by exogenous factor endowments but by cumulative effects that come from changes in techniques, product quality renewal and economies of scale.

The results show that, in general, specialization positively and significantly affects the economic competitiveness of countries in the region. The decomposition of the structure of specialization led to the result that specialization in manufactured goods, petroleum products and high technology positively and significantly affects economic competitiveness, whereas specialization in raw agricultural materials and commodities has negative and significant effects. A third result reveals that the effects of specialization structure on economic competitiveness are similar for SSA member countries belonging to Central

Africa, East Africa, and West Africa, but vary slightly with those of SSA members belonging to South Africa.

These results suggest that, in general, to enhance their competitiveness in the global market, SSA countries need to specialize in the production and export of goods in which they have a comparative advantage related to their factor endowment. Specifically, these countries need to specialize in the production and export of manufactured goods, petroleum products, and high-tech goods. It is therefore important to emphasize that, given their similar comparative advantages, these countries would benefit from strengthening their bilateral cooperation in order to improve their value chains and thus benefit from gains in economic competitiveness. On the other hand, they must reduce the production of basic commodities and the use of raw agricultural materials.

However, this research is not without its limitations. The research was conducted in the context of developing countries in SSA, which are characterized by diversity in production and exports. This diversity was not considered in this study. Thus, if the results of this research are to be generalized, this work should be strengthened by taking into account the characteristics of the countries in terms of production and institutions and the evolution of their openness and economic specializations.

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APPENDIX

Appendix 1. Stationarity test

Test de Levin-Lin-Chu en niveau

In level				In first difference		
Variables	Statistics	Probability	Decision	Statistics	Probability	Decision
gci	-6.1789	0.0000	Stationnaire	-	-	-
isk	1.1900	0.1170	Not stationary	-8.0193	0.0000	Stationary
acr_tic	1,1517	0,1247	Not stationary	-5.3476	0.0000	Stationary
acr_bien_manu	1,5080	0,9342	Not stationary	-7.5670	0.0000	Stationary
acr_carbu	0,0359	0,4857	Not stationary	-13.7629	0.0000	Stationary
acr_haute_tec	1,1266	0,1300	Not stationary	-10.5803	0.0000	Stationary
acr_mat_agri_brut	1,7074	0,9561	Not stationary	-2.1897	0.0143	Stationary
acr_min_metaux_preci	1,2931	0,0980	Not stationary	-8.0462	0.0000	Stationary
acr_prod_bas	1.300	0,9134	Not stationary	-6.6658	0.0000	Stationary
stpo	-3.6943	0.0001	Stationary	-	-	-
ccorup	-5.2395	0.0000	Stationary	-	-	-
fbcf	1.300	0,9134	Not stationary	-7.5253	0.0000	Stationary
ouec	1.6943	0.1536	Not stationary	-7.4620	0.0000	Stationary
ch	1,530	0,8185	Not stationary	-5.9523	0.0000	Stationary
devfin	1,467	0,3446	Not stationary	-11.4307	0.0000	Stationary
						Stationary

Test d'Im, Pesaran et Shin en niveau

In level				In first difference		
Variables	Statistics	Probability	Decision	Statistics	Probability	Decision
gci	-6.0206	0.0000	Stationary	-	-	-
isk	0.0361	0.4856	Not stationary	-7.5384	0.0000	Stationary
acr_tic	0,5080	0,9342	Not stationary	-5.0145	0.0000	Stationary
acr_bien_manu	0,0831	0,4669	Not stationary	-7.6898	0.0000	Stationary
acr_carbu	0,0083	0,5033	Not stationary	-7.5878	0.0000	Stationary
acr_haute_tec	1,002	0,8862	Not stationary	-7.3948	0.0000	Stationary
acr_mat_agri_brut	0,462	0,9849	Not stationary	-7.4226	0.0000	Stationary
acr_min_metaux_preci	0,834	0,9627	Not stationary	-7.8181	0.0000	Stationary
acr_prod_bas	0,467	0,3446	Not stationary	-7.0838	0.0000	Stationary
stpo	-6.8888	0.0000	Stationary	-	-	-
ccorup	-6.1857	0.0000	Stationary	-	-	-
fbcf	0.9375	0,2142	Not stationary	-7.1232	0.0000	Stationary
ouec	0,9312	0,7148	Not stationary	-7.0145	0.0000	Stationary
ch	0,5125	0,3254	Not stationary	-6.7063	0.0000	Stationary
devfin	1.02711	0,1123	Not stationary	-6.2475	0.0000	Stationary

Appendix 2. List of the four zones

Zone 1 : Central SSA	Zone 2 : East SSA	Zone 3 : South SSA	Zone 4 : West SSA
Burundi	Ethiopia	South Africa	Benin
Cameroon	Kenya	Botswana	Burkina Faso
Rwanda	Madagascar	Lesotho	Cape Verde
	Mauritius	Malawi	Ivory Coast
	Uganda	Mozambique	Gambia
	Swaziland	Namibia	Ghana
	Tanzania	Zambia	Mali
		Zimbabwe	Mauritania
			Nigeria
			Senegal

Appendix 3. List of SSA countries in the global sample

Benin	Kenya	Uganda
Botswana	Lesotho	Rwanda
Burkina Faso	Madagascar	Senegal
Burundi	Malawi	South Africa
Cameroon	Mali	Swaziland
Cape Verde	Mauritius	Tanzania
Ethiopia	Mozambique	Zambia
Gambia	Namibia	Zimbabwe
Ghana	Mauritania	
Ivory Coast	Nigeria	