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Globalization and structural change in Sub-Saharan countries: A PMG/ARDL approach

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Abstract

This research aims to analyze the effect of globalization on the patterns of structural change in Sub-Saharan (SSA) countries. Two types of variables including trade volume and capital flow (FDI inward) are used to measure globalization. As methodological approach, we first determined patterns of structural change by using the formula of the decomposition of labor productivity growth. Secondly, as structure transformation, a dynamic heterogeneous panel ARDL model is used. Data come from Groningen Growth and Development Center (GGDC) data base, which provides employment and real valued added statistics for 16 SSA countries disaggregated into 10 sectors, from 1996 to 2018. The main results show that the two instruments of globalization, FDI and trade, have differentiated effects on the pattern of structural change in SSA countries. Inward FDI has a positive and significant effect on structural change in SSA countries. While trade contributes negatively and significantly to structural transformation in these economies. Thus, unlike trade flows, FDI has made a positive contribution to improve labor productivity in the economies of sub-Saharan African countries, by inducing a reallocation of labor from the low-productivity agricultural sector to the high productivity non-agricultural sector.

Keywords: Globalization, Structural Change, Sub-Saharan countries

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1. Introduction

A structural change is defined as the reallocation of labor across sectors with different productivity levels, which is central for economic development. Indeed, structural transformation allows labors flow from low-productivity activities (agriculture) to high productivity activities (manufacture or services), which is a key driver of development (Macmillan et *al.*, 2014). Despite the fact that the share of agricultural employment remains important in Africa, the continent has, nevertheless, experienced a structural transformation of its economy, since the decade 2000. In fact, recent studies have shown that the share of the labor force engaged in agriculture has substantially declined across most of the Sub-Sahara African (SSA) countries (Kruse et *al*., 2023). It has moved from low productivity agriculture to higher productivity services and manufacturing (Diao et *al.*, 2017). This contributed positively to Africa's overall productivity growth and poverty reduction (Macmillan et *al.*, 2014; Diao et *al.*, 2017).

At the same period, all the economies of Africa, almost without exception, became more integrated with the world economy. For proof, foreign trade measured in terms of imports and exports of goods and services represents more than 50 percent of GDP in many parts of Sub-Saharan Africa[1] . Flows of Foreign Direct Investment (FDI) to Africa and to the Sub-Sahara African (SSA) region in particular, have also increased. According to the 2009 World Investment Report (UNCTAD, 2009), inflows of FDI to the region have risen from US$ 9 billion in 2000 to US$ 68.2 billion in 2007 and has reached US$ 88 billion, its highest level in 2008. All of these may suggest that there is a linkage between globalization and structural change.

In fact, at the theoretical level, such a linkage may be explained by the fact that international trade aims to promote specialization via an efficient reallocation of employment and other factors of production across sectors. Two dimensions based on specialization patterns are proposed to explain how the international trade affects the structural change. First, the decline in the trade cost due to the comparative advantage affects the labor allocation across sectors. Second, the differences of productivity growth among sectors also due to the comparative advantage affect the labor reallocation (Uy et *al*, 2013). In addition, globalization impacts the structural change by facilitating technology transfer and by contributing efficiently in the production through FDI flows. As shown by Buera and Kaboski (2009), technologies play an

[1] http://data.worldbank.org/indicator/NE.TRD.GNFS.ZS

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important role in the structural change. They argue that scale technologies are the origin of the structural change insofar as scale technologies allow to move from traditional, small-scale, cottage industry technologies to large-scale manufacturing during development.

Empirical studies testing the linkage between the globalization and the structural change are very limited because of difficulties to have data on the structural change. The only studies that have attempted to do so, have analyzed the respective effects of raw trade and FDI flows on the structural transformation (Macmillan et *al*., 2014; Mühlen and Escobar, 2019). Macmillan et *al*., (2014) find that the share of the exports of a country that is accounted for by raw materials has a negative effect on the structural change. Whereas, FDI inflows have a positive impact on the structural change (Mühlen and Escobar, 2019).

The current debate on globalization is to whether it is good or bad for developing countries. Globalization is good when it promotes structural change, which is an important source of growth and poverty reduction. Over the 2000s, SSA countries have experienced a structural transformation, so the research question is: what is the importance of globalization in the structure change in this region?

The objective of this research is to study the importance of globalization in the structure change in SSA countries. More specifically, it seeks first to determine patterns of structural change and productivity growth and second to analyze the impact of trade volume and capital flow (FDI) on the patterns of structural change in this region.

This research is motivated by a lack of empirical studies focusing on the linkage between globalization and structural change in developing countries, especially in SSA countries. To fill the gap, unlike existing studies, we use a dynamic approach to assess the effect of globalization on structural change. This is consistent with the dynamic nature of structural transformation.

The main results show that the two instruments of globalization, FDI and trade, have differentiated effects on the pattern of structural change in SSA countries. Inward FDI has a positive and significant effect on structural change in SSA countries. While trade contributes negatively and significantly to structural transformation in these economies. So, unlike trade flows, FDI has made a positive contribution to improving labor productivity in the economies of sub-Saharan African countries, inducing a reallocation of labor from the low-productivity agricultural sector to the more productive non-agricultural sectors.

The rest of the paper is organized as follows: Section 2 presents the literature review. Section 3 discusses the methodological problems. Results and discussion are presented in Section 4 and section 5 concludes.

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2. Literature review

2.1.Theoretical link between globalization and structural change

Globalization and structural change relationship has been the subject of several theoretical studies but few empirical works. At the theoretical level, the linkage between globalization and structural change or structural transformation has been analyzed in an open economy framework using three-sector (agriculture, manufacturing and service) and two-country models. These models seek to explain the extent to which openness affects structural transformation (Herrendorf et *al*. 2014).

The first study began with the paper of Matsuyama (2009). The author used a simple two-country model in which the preferences of consumers are non-homothetic over the three consumption goods: food, manufactured goods and services. In his model, only manufactured goods and services are produced with technologies that are linear in labor. And he assumed that agricultural and manufactured goods can be traded with the rest of the world at zero trade costs whereas services cannot be traded. He showed on the one hand that if there is a technological progress in manufacturing then the total manufacturing labor of both countries declines. On the other hand, if one of the two countries experiences stronger technological progress in manufacturing than the other, then manufacturing labor in the first country may initially increase while manufacturing labor in the second country decreases unambiguously. These results highlight the importance of technology differences across sectors in structural change.

Similarly, Yi and Zhang (2010) also used a three-sector and two-country models. But unlike Matsuyama (2009), they assumed that all the goods are produced with labor only and that one country has higher productivity growth in manufacturing than the other country. Yi and Zhang (2010) showed that the country with the higher productivity growth in manufacturing experiences a hump shape in the shares of manufacturing employment and value added while the other country experiences a downward-sloping shape in the shares of manufacturing labor and value added.

The two previous studies have assumed that agricultural and manufactured goods are tradeable without costs, which implies that each country specialized in either agriculture or manufacturing compatible with the comparative advantage. Yet, in the real world, trade costs exist and are able to be influenced by trade policies. Thus, Uy et *al.* (2013) incorporated both productivity and trade cost shocks in the benchmark model. They found that the shock processes explain virtually all of the evolution of agriculture and services labor shares, and the rising part

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of the hump-shape in manufacturing. Furthermore, taking into account trade reforms in their model, Betts et *al.* (2013) found that international trade affects the structural change.

Unlike others studies that consider three-sector models, Teignier (2012) used a two-country model with two sectors, agriculture and the rest of the economy. Because, according him, the transition out-of-agriculture is a key aspect of economic development. He found that international trade plays a crucial role in structural transformation.

2.2.Empirical evidences

Empirical evidences are limited and provide generally the results of the simulation of theoretical models. Thus, Teignier (2018) calibrated his model to quantify the role of trade in structural change in South Korea during the last 50 years and Great Britain in the 19th century. He found that agricultural imports played a crucial role in the early transformation of Great Britain, while, in South Korea, trade also had a positive impact on its structural transformation but this impact is less important because of the introduction of agricultural protection policies. Betts et *al.* (2013) also calibrated their model with data on South Korea and the OECD. Their model predicted the reallocation of Korean labor from agriculture into industry and services from 1963 through 2000. They showed that Korean trade reforms are important for the accuracy of this predicted structural change.

With regard to empirical work using econometric models, Macmillan et *al.* (2014), using a cross-sectional analyze, found that natural resources share of country's exports is negatively correlated to structural change in 38 developing countries. In the same way, Mühlen and Escobar (2019) analyzed the impact of FDI on structural change in Mexico covering the period 2006–2016. Using the fixed-effects estimator, they found a positive effect from FDI on growth-enhancing structural change. This effect depends critically on the lag structure of FDI.

3. Methods and data

3.1.Methods

Before analyzing the impact of globalization on the patterns of structural change in SSA, we first determined patterns of structural change and productivity growth in this region. To do this, we used the formula of the decomposition of labor productivity growth proposed in Macmillan et *al.* (2014). According to them, labor productivity growth in an economy can be achieved in one of two ways. First, productivity can grow within economic sectors through capital accumulation, technological change, or reduction of misallocation across plants. Second, labor can move across sectors, from low-productivity sectors to high-productivity

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sectors, increasing overall labor productivity in the economy. Thus, we have the following decomposition:

$$\Delta Y_t = \sum_{i=n} \theta_{i,t-k} \Delta y_{i,t} + \sum_{i=n} y_{i,t} \Delta \theta_{i,t} \qquad (1)$$

Where Y_t and y_t are economy-wide and sectoral labor productivity levels, respectively. $\theta_{i,t}$ is the share of employment in sector i at time t and the Δ operator denotes the change in productivity or employment shares between $t-k$ and t. In this study, we have considered two main sectors: the agricultural sector and the non-agricultural sector, $n=2$.

The first term in the decomposition is the weighted sum of productivity growth within individual sectors, where the weights are the employment share of each sector at the beginning of the time period. It is called the "*within component of productivity growth*". The second term captures the productivity effect of labor re-allocations across different sectors. It is called "*the structural change term*". This term will be positive when changes in employment shares ($\Delta\theta_{i,t}$) are positively correlated with productivity levels (y_t), which will lead to an increase in economy-wide productivity growth (Macmillan et *al.*, 2014).

3.1.1. Specification of econometric model

As structure transformation is a dynamic process, we used a dynamic heterogeneous panel ARDL model to analyze the impact of trade volume and capital flow on the patterns of structural change in SSA. The choice of this model also stems from the fact that our database covers the period from 1996 to 2018 for 16 sub-Saharan African countries (where T = 23, the number of years, is greater than N = 16, representing the number of countries). In general, the ARDL panel model is specified as follows:

$$y_{it} = \sum_{j=1}^{p} \lambda_{it} y_{i,t-j} + \sum_{j=0}^{q} \delta_{ij}' X_{i,t-j} + \mu_i + \varepsilon_{it} \qquad (1)$$

Where y_{it} denotes the format dependent variables (k x 1) and $X_{i,t}$ a matrix of explanatory variables, μ_i represents the individual fixed effects, λ_{it} are the coefficients assigned to the lagged dependent variables $y_{i,t-j}$. δ_{ij}' are the coefficients vectors (k x 1). The disturbances ε_{it} are independently and identically distributed across i and t, with means 0 and variances $\sigma_\varepsilon^2 > 0$, $\varepsilon_{it} \rightarrow iid\left(0, \sigma_\varepsilon^2\right)$.

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Assuming that the variables in equation (1) are cointegrated, then the equation can be reformulated to obtain an error-correction panel model in which the short-term and long-term dynamics between these variables are as follows:

$$\Delta y_{it} = \phi_i y_{t-1} + \beta_i' X_{it} + \sum_{j=0}^{p-1} \lambda_{ij}^{*} \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \delta_{ij}^{*} \Delta X_{i,t-j} + \mu_i + \varepsilon_{it} \qquad (2)$$

Where $\Delta y_{it} = y_{it} - y_{i,t-1}$, $\phi_i = -\left(1 - \sum_{j=1}^{p} \lambda_{ij}\right)$, $\beta_i = \sum_{j=0}^{q} \delta_{ij}$, $\lambda_{ij}^{*} = -\sum_{m=j+1}^{p} \lambda_{im}$ and $\delta_{ij}^{*} = -\sum_{m=j+1}^{q} \delta_{im}$

The parameter ϕ_i is the error correction of the adjustment term. According to Pesaran et *al* (1999), the existence of a long-term relationship between y_{it} and $X_{i,t}$ requires ϕ_i to be negative. By contrast, if $\phi_i = 0$, there is no evidence of a long-term relationship between the dependent and independent variables. In the context of our study, this equation is written as follows:

$$\Delta SC_{it} = \mu_i + \varphi_t + \phi_i SC_{i,t-1} + \beta_1 LnFDI_{it} + \beta_2 TRADE_{it} + \beta_3 HCI_{it} + \beta_4 LnGDPH_{it} + \beta_5 FORCE_{it} + \beta_6 INFL_{it} + \beta_7 GOV_{it} + \sum_{j=0}^{q-1} \delta_{ij}^{*'} \Delta X_{i,t-j} + \varepsilon_{it} \qquad (3)$$

Where ϕ_i captures the error correction component and a measure of the speed at which the model returns to equilibrium. β_i captures the long-term equilibrium relationships between our dependent and independent variables. The μ_i and φ_t terms represent fixed and temporal effects respectively. $\sum_{j=0}^{q-1} \delta_{ij}^{*'} \Delta X_{i,t-j}$ captures the short-term dynamic effects measured by $\delta_{ij}^{*'}$, the parameters associated with the X matrix of dependent variables as specified below.

$$\sum_{j=0}^{q-1} \delta_{ij}^{*'} \Delta X_{i,t-j} = \delta_1 \Delta LnFDI_{it} + \delta_2 \Delta TRADE_{it} + \delta_3 \Delta HCI_{it} + \delta_4 \Delta LnGDPH_{it} + \delta_5 \Delta FORCE_{it} + \delta_6 \Delta INFL_{it} + \delta_7 \Delta GOV_{it} \qquad (4)$$

With regard to variables, SC_{it} is the structural change in the country i in year t, $i = 1, I$ and $t = 1, T$. $TRADE_{it}$ is the trade volume measured by the degree of openness in the country i in year t. FDI_{it}, the inflows of foreign direct investment towards a country i in year t. The control variables include GDP per capita, labor force participation rate, human capital index, inflation rate, and governance indicator.

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3.1.2. Parameters identification strategies

To identify model parameters, we used PMG/ARDL estimators proposed by Pesaran et *al*. (1999) by adopting likelihood approach. The choice of PMG/ARDL estimator is because it allows controlling the long-run parameters to be constant across individual country groups however permitting the short-term estimates, error variances, and imposes heterogeneity in intercepts. It is considered as a dominant model in terms of reliability and efficiency if the long-term prerequisites are valid. PMG/ARDL model provides an advantage of obtaining long-term and short-term estimates simultaneously, regardless the series is I(1) or I(0). The model estimation procedure began with the Pesaran (2004) Cross Section Dependency (CSD) test that deals with both CSD and heterogeneity. Next, we assessed the stationarity of the variables using Pesaran's (2007) CIPS test. Finally, we performed the Pedroni (1999, 2004) and Kao (1999) cointegration tests to examine the presence of cointegrating relationships between model variables.

After estimating the model using the PMG estimator, we tested the homogeneity of the long-term coefficients using a Hausman-type test applied to the difference between the MG and PMG estimators. Under the null hypothesis, this difference is not significant and the PMG estimator is therefore preferable.

3.2.Data

3.2.1. Description of variables

The data for this study is taken from the updated and extended Groningen Growth and Development Center (GGDC) database[2]. The database provides employment and real valued added statistics for 27 countries (whose 16 SSA countries) covering the ten main sectors of the economy over the period 1990-2018 for African countries. These ten sectors are grouped into two main sectors: the agricultural sector and the non-agricultural sector, which includes industry and services. The agriculture activities (sector 1) include agriculture, hunting, forestry and fishing. For the non-agricultural sector, industries include mining (sector 2), manufacturing (sector 3) and other industry (constructions and public utilities: sector 4 and 5 respectively). And services take in account both market and non-market services. Market services include distribution (sector 6), trade (sector 7), financial services (sector 8), government services (sector 9) and other services (sector 10) (Timmer et *al*., 2014). This data allowed to determine the pattern of the structure change of equation (1). Concerning variables including GDP per capita,

[2] The Groningen Growth and Development Centre 10 Sector Database is available from: http://www.ggdc.net/dseries/10-sector.html.

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FDI, TRADE, Inflation rate, labor force participation rate, and governance indicators, data come from the World Development Indicator (WDI 2016), and Kaufmann et *al*. (2010) respectively. Human capital index is based on average years of schooling and the return to education. This data comes from Penn World Table (PWT 10).

3.2.2. Descriptive statistics

Table 1 reports the descriptive statistics for the different variables in the model. We note that the average value of the structural transformation variable is positively estimated at 11.73% over the period 1990-2018, revealing a significant onset of structural change in sub-Saharan African countries. As a result, these countries have seen a reallocation of labor from the less productive agricultural sector to the more productive non-agricultural sectors.

Indeed, as shown in Figure 1, most of the studied countries experienced a transformation of their economy over the period 1990-2018. Structural changes have been more significant in some countries than others. Countries such as Rwanda, Senegal, Burkina Faso, Cameroon, and South Africa have undergone a strong transformation, while this has been less significant in Ethiopia, Ghana, Uganda, and Botswana.

Table 1: descriptive statistics of variables

Variables	Obs	Mean	Std. dev.	Min	Max
SC	352	11.73696	30.41315	-325.4152	130.0334
WITHIN	352	4.713641	50.21691	-255.1515	307.2492
FDI	352	13880.81	31615.33	15.84494	179564.8
TRADE	352	.6359366	.2540943	.2072252	1.321991
GDPH	352	2301.12	2530.361	187.5167	10577.2
HCI	352	1.86782	.4809354	1.057338	2.911752
FORCE	352	.7071105	.1042112	.4711	.8826
INFL	352	.0967301	.114301	-.0635094	1.126937
GOV	352	-.7970096	.6306047	-1.884151	1.056994

Source: Authors

In addition to structural change, which reveals extra-sectoral change, we find that countries have also experienced intra-sectoral transformations of their economies, with a positive within value estimated at 4.41% on average over the period 1990-2018 (Table 1). This means that the

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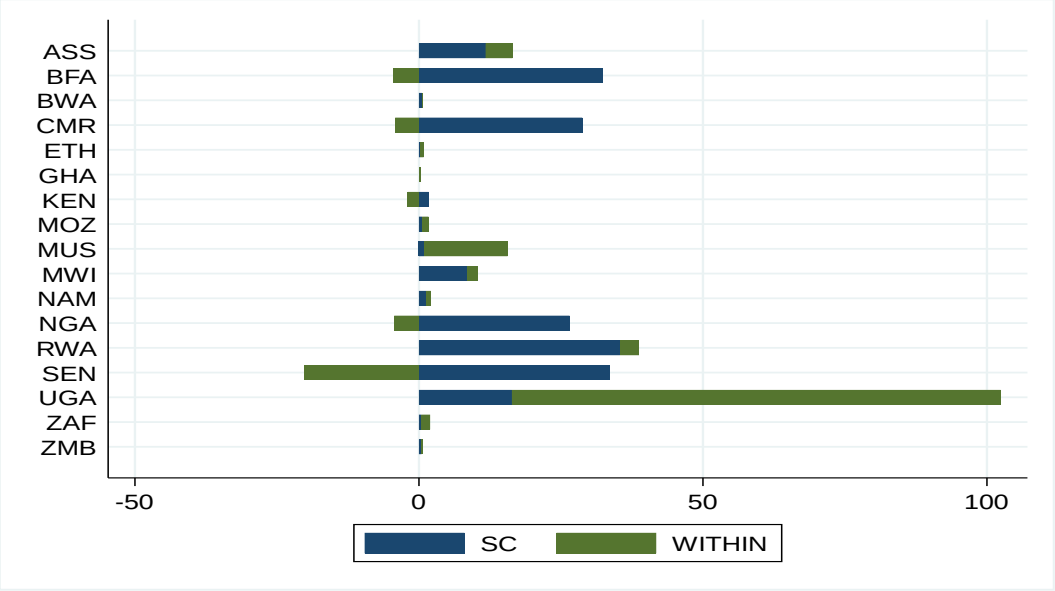
reallocation of labor has also taken place within the agricultural and non-agricultural sectors. These intra-sectoral transformations were significant in Uganda (86.04%) and Mauritius (14.70%). However, they were negative in Senegal, Nigeria, and Cameroon (Figure 1).

In terms of other variables, FDI stocks are estimated to average less than $14 billion. The minimum and maximum values are $15 million and $180 billion respectively, indicating a wide dispersion of FDI from SSA countries. Similarly, the average rate of trade openness is over 60%, which means that SSA countries are largely integrated into trade globalization. GDP per capita is valued at an average of 2031 US dollars, with disparities ranging from 187 to 10577 US dollars. The human capital index per capita is an average of 2. The index values range from 1 to 3. This means that there has been an improvement in the average number of years of schooling and educational performance in SSA countries.

The proportion of the working population averages over 70% in SSA countries, with disparities ranging from 40% to over 80%. This reflects the abundance of labor in SSA. Inflation remains under control at an average level of 0.9%. As for the governance indicator, the average value is negative, below the world average of zero. This means that the quality of governance in SSA is low on average.

Figure 1: Decomposition of total labor productivity



Source: Authors

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3.2.3. Dependency and unit root tests

The results of the cross-sectional dependence and unit root tests are presented in table 2. It shows that the tests strongly reject the null hypothesis of cross-sectional independence of the two explained variables. This shows that there is a significant level of cross-sectional dependence for both SC and WITHIN, which led us to use second-generation unit root tests, in this case, the CIPS test.

CIPS test results reveal on the one hand, that the null hypothesis of the presence of a unit root for the variables SC and WITHIN in levels can be rejected, suggesting that these variables are stationary, i.e. I (0). The same holds for the FDI, Inflation, and Force variables. On the other hand, the null hypothesis of the presence of a unit root cannot be rejected for the variables Trade, GDPH, HCI, and GOV in levels. However, these variables are stationary in the first difference (Table 2).

As the model variables are both I(0) and I(1), this justifies the use of the panel ARDL model. Since this panel ARDL model implies a long-term relationship between the variables, it leads to perform the cointegration test. Two cointegration tests were performed: Pedroni (1999, 2004) and Kao (1999). The results show that the null hypotheses of non-cointegration are rejected at 1%, suggesting a cointegrating or long-term relationship between the variables (see tables 3 and 4 in Appendix).

Table 2: Cross-section dependency and unit root tests

Variables	CSD TEST	Panel unit root test	
		CIPS (at level)	CIPS (at first difference)
SC	255.796*** (0,000)	-3.249***	-
WITHIN	399.885*** (0,000)	-3.276***	-
ln(FDI)		-2.652***	-
TRADE		-1.674	-3.520***
ln(GDPH)		-1.838	-3.397***
HCI		-1.528	-2.283***
INFL		-3.894***	-
FORCE		-2.219**	-
GOV		-2.203	-4.689***

Notes: ***p<0.01, ** p<0.05, * p<0.1 are significance levels with critical thresholds at 2.38; 2.2; 2.11 respectively. Values in brackets are P-values.

Source: Authors

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4. Results and discussion

Table 5 presents the results of estimating long-term coefficients, given that structural change is a long-term phenomenon. Additionally, the error correction parameter of the adjustment term is negative and significant at the 1% level, proving the existence of a long-term relationship. However, the results of the short-term coefficients are shown in table 6. Equations 1 and 2 give the results for structural change and intra-sectoral (Within) change respectively.

The results of equation 1 generally show that the two instruments of globalization, FDI and trade, have differentiated effects on the pattern of structural change in SSA countries.

Specifically, the coefficient associated with FDI is positive and significant at the 1% level, reflecting a positive long-term effect of FDI on structural change. In other words, FDI has positively contributed to improving labor productivity in the economies of SSA countries, induced by a reallocation of labor from the low-productivity agricultural sector to the more productive non-agricultural sectors. This result is consistent with those found by Mühlen and Escobar (2019) and Amendolagine et *al*. (2017), who highlighted the driving role of FDI in structural change.

With regard to trade, however, the results reveal that trade has a significantly negative effect on structural change. As a result, the structure of trade has not favored a productive reallocation of labor from the agricultural sector to other productive sectors. This can be explained by the large share of raw materials in exports from SSA countries[3], which tends to limit the expansion of agro-industrial activities providing productive employment. This is consistent with the results found by Macmillan et *al*. (2014).

The coefficient associated with the human capital index has a positive sign and is significant at 10%. This means that human capital has had a positive effect on structural change in SSA countries. This result shows that the development of human capital over the last three decades has been a driving force accelerating the structural transformation of SSA economies. Better-educated, and therefore more productive, individuals are turning away from lower-paid agricultural jobs in favor of more attractive jobs in the industrial and service sectors.

In contrast, the growth rate of GDP per capita has a negative and significant effect on structural change in SSA countries in the long-term. This result is counterintuitive, but could be explained

[3] According to UNCTAD (2022) report, 83 per cent of African countries are commodity dependent, accounting for 45 per cent of the commodity-dependent countries worldwide. This means that commodities account for a very large share of Africa's total merchandise exports.

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by the non-inclusive nature of growth in these countries (Ncube, 2015; Houngbonon et *al*., 2014). However, in the short term, this effect is significantly positive (see Table 6).

Similarly, the labor force participation rate negatively affected structural change in SSA countries due to the large share of the agricultural sector of jobs created in these countries' economies.

With regard to equation 2, which presents the results of intra-sectoral (Within) change, we note that the instruments of globalization have had no significant effect on intra-sectoral change in the economies of SSA countries. Nevertheless, human capital development has significantly and positively improved intra-sectoral labor productivity.

Table 5: Result of estimating long-term coefficients

Variables	SC (1)	WITHIN (2)
Long term coefficients		
$LnFDI_{it}$	.001836 ***	-.0022609
	(.0004125)	(.0015568)
$TRADE_{it}$	-.0033608 ***	-.0012074
	(.0010452)	(.0035795)
HCI_{it}	.0210198 *	.1405871 ***
	(.0114115)	(.0340838)
$LnGDPH_{it}$	-.0132802 ***	-.0134587
	(.0039577)	(.0110391)
$FORCE_{it}$	-.1792384 ***	.0505565
	(.0420115)	(.062365)
$INFL_{it}$	-.0074545	.0045901
	(.0058209)	(.0050895)
GOV_{it}	-.0009056	.0023833
	(.0009496)	(.0036809)
Error correction term	-.8684128 ***	-1.011764***
	(.091239)	(.075027)
Hausman test-statistic	0.21	0.44
	(0.9989) [a]	(0.9996) [a]
Observations	336	336

Notes: ***p<0.01, ** p<0.05, * p<0.1 are significance levels. Numbers in brackets are robust standard deviations in the presence of heteroskedasticity and autocorrelation (HAC). [a] associated p-values.

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5. Conclusion

The current debate on globalization is whether or not it is beneficial to developing countries, which have become more integrated into the world economy since the 2000s. At the same time, these countries have undergone a structural change in their economies, characterized by a declining trend in the proportion of the workforce engaged in agriculture.

In this paper, we analyze the effect of globalization on the patterns of structural change in Sub-Saharan countries. To do this, we first determined patterns of structural change by using the formula of the decomposition of labor productivity growth proposed in Macmillan et *al.* (2014). Second, since structural transformation is a dynamic process, a dynamic heterogeneous panel ARDL model is used. The main results show that the two instruments of globalization, FDI and trade, have differentiated effects on the pattern of structural change in SSA countries. Inward FDI has a positive and significant effect on structural change in SSA countries. While trade contributes negatively and significantly to structural transformation in these economies. So, unlike trade flows, FDI has made a positive contribution to improving labor productivity in the economies of sub-Saharan African countries, inducing a reallocation of labor from the low-productivity agricultural sector to the more productive non-agricultural sectors.

Furthermore, the findings reveal that human capital index has a positive effect on structural change in SSA countries. This means that the development of human capital over the last three decades has been a driving force accelerating the structural transformation of SSA economies. These results underline the importance of FDI and human capital development, as key factors in stimulating the structural transformation of African economies.

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References

Amendolagine, V., Coniglio, N. D., & Seric, A. (2017). Foreign Direct Investment and Structural Change in Africa: Does Origin of Investors Matter? In Foreign capital flows and economic development in Africa (pp. 97{125). New York: Palgrave Macmillan US. doi: 10.1057/978-1-137-53496-5 5

Betts, C., Rahul G., and Rubina V. (2013). Trade, Reform, and Structural Transformation in South Korea, Manuscript, University of Southern California.

Buera, F. J. and Kaboski, J. P. (2009). The Rise of the Service Economy, NBER Working Paper 14822

Diao,X., Harttgen, K. and McMillan, M., (2017). The Changing Structure of Africa's Economies, Worldbank, Policy Research Working Paper 7958.

Herrendorf, B., R. Rogerson, and Á. Valentinyi. (2014). Growth and Structural Transformation. In Aghion and Durlauf, eds. Handbook of Economic Growth 2. Amsterdam: North-Holland, 855–941.

Houngbonon, V., A. Bauer, A. Ndiaye, C. Champagne, T. Yokossi, N. Ferrière, H. Brahimi, J. Avril, (2014). Assessing the Inclusiveness of Growth in Africa: Evidence from Cameroon, Senegal, and Tanzania, WIDER Working Paper Series wp-2014-120, World Institute for Development Economic Research (UNU-WIDER).

Kao, C. (1999). Spurious regression and residual-based tests for cointegration in panel data. *Journal of econometrics*, 90(1), 1-44.

Kaufmann, D., Kraay, A., Mastruzz, A., (2010). The Worldwide Governance Indicators: Methodology and Analytical Issues, Worldbank, Policy Research Working Paper 5430.

Kruse, H., Mensah, E., Sen, K., & de Vries, G. (2023). A manufacturing (re) naissance? Industrialization in the developing world. *IMF Economic Review*, 71(2), 439-473.

McMillan M., D. Rodrik, and I. Verduzco-Gallo. (2014). Globalization, Structural Change, and Productivity Growth, with an Update on Africa. *World Development* 63: 11–32

Matsuyama, K. (2009). Structural Change in an Interdependent World: A Global View of Manufacturing Decline, *Journal of the European Economic Association* **7**(2-3), 478–486.

Mühlen, H and O. Escobar. (2019). The Role of FDI in Structural Change: Evidence from Mexico. *The World Economy*, (), twec.12879–. doi:10.1111/twec.12879

Ncube, M. (2015). Inclusive growth in Africa. In Monga, C & Lin, J (Eds.), The Oxford handbook of Africa and economics: Volume 1. Oxford University Press, London.

Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and statistics*, 61(S1), 653-670.

Pedroni, P. (2004). Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Econometric theory*, 20(3), 597-625.

Pesaran, M. H. (2004). General diagnostic tests for cross section dependence in panels. Cambridge Working Papers in Economics, 0435(3), 1–39. https://ideas.repec.org/p/cam/camdae/0435.html

Pesaran, M.H. (2007). A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Econometrics*. 22, 265–312

Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American Statistical Association*, 94, 621–634. https://doi.org/10.1080/01621459. 1999.10474156

Ratha, D., Mohapatra, S., Özden, C., Plaza, S., Shaw, W., Shimeles, A. (2011) Leveraging migration for Africa: remittances, skills, and investments, The World Bank.

Teignier M. (2018). The role of trade in structural transformation, *Journal of Development Economics*, V. 130, Pages 45-65, ISSN 0304-3878.

Timmer, M., G., de Vries and K., de Vries (2014). Patterns of Structural Change in Developing Countries, GGDC Research Memorandum 149

Święcki, T. (2017). Determinants of Structural Change, *Review of Economic Dynamics* 24, 95-131

UNCTAD (2009). World Investment Report – Transnational Corporations, Agricultural Production and Development, United Nations, New York and Geneva

UNCTAD (2022). Rethinking the Foundations of Export Diversification in Africa: The catalytic role of business and financial services, United Nations, New York and Geneva

Yi, K.-M., & Zhang, J. (2010). Structural change in an open economy, Discussion Paper No. 595, Gerald R. Ford School of Public Policy.

Uy, T., Yi, K.-M., & Zhang, J. (2013). Structural change in an open economy. *Journal of Monetary Economics*, 60(6), 667–682.

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Appendix

Table 3: Panel cointegration test: Pedroni test

	Statistic	p-value
Modified Phillips–Perron t	2.7766	0.0027
Phillips–Perron t	-9.5104	0.0000
Augmented Dickey–Fuller t	-10.2773	0.0000

Table 4: Panel cointegration test: Kao test

	Statistic	p-value
Modified Dickey–Fuller t	-3.5709	0.0002
Dickey–Fuller t	-6.2743	0.0000
Augmented Dickey–Fuller t	-3.7743	0.0001
Unadjusted modified Dickey–Fuller	-17.6492	0.0000
Unadjusted Dickey–Fuller t	-11.5867	0.0000

Table 6: Result of estimating short-term coefficients

Variables	SC (1)	WITHIN (2)
short term coefficients		
$\Delta LnFDI_{it}$	-.5043578	.6861522
	(.6026712)	(.7815404)
$\Delta TRADE_{it}$	.2230587	-.506085
	(.2195093)	(.3448046)
ΔHCI_{it}	11.64015	-22.49289
	(14.33954)	(22.79931)
$\Delta LnGDPH_{it}$	1.954783**	3.216904***
	(.9346406)	(1.061903)
$\Delta FORCE_{it}$	-11.41225	40.32398
	(32.05295)	(25.64836)
$\Delta INFL_{it}$	.1200366	-.4027457
	(.1423554)	(.383883)
ΔGOV_{it}	-.3709654	.0983353
	(.3051638)	(.1666503)
CONS	-7.980684	-1.256908
	19.17715	(29.15237)
Observations	336	336

Notes: ***p<0.01, ** p<0.05, * p<0.1 are significance levels. Numbers in brackets are robust standard deviations in the presence of heteroskedasticity and autocorrelation (HAC).