Lafia Journal of Economics and Management Sciences: Volume 7, Issue 2; 2022
ISSN: 2550-732X
Published by Department of Economics, Federal University of Lafia, Nigeria

Structural Change and Economic Growth in Nigeria

Bilyaminu Mohammed[1], Nuruddeen Mahmud Bunu[2], Abdulhamid Hamman Bazza[3], Aisha Adamu Hassan[4], Mohammed Bashir Adamu[5], Saidu Yahaya[6], Amina Bala Usman[7] & Sa'ad Abubakar[8]

[1&5]Department of Cooperative Economics and Management, Adamawa State Polytechnic, Yola
[2]Department of Economics, Modibbo Adama University, Yola
[3&6]Department of Banking and Finance, Adamawa State Polytechnic, Yola
[4]Department of Economics, Gombe State University, Gombe
[7]Department of General Studies, Federal Polytechnic Bali, Taraba State
[8]Department of Business Administration and Management, Adamawa State Polytechnic, Yola.
Corresponding Email: abukhadij@gmail.com

Abstract
This study investigates structural change and growth nexus in Nigeria using data on value-added shares in agriculture, manufacturing and the service sectors for the period from 1980 until 2021. A bivariate autoregressive distributed lags (bivariate-ARDL) model is employed for the empirical analysis. ARDL model is a single-equation model that has been used for decades in modelling the relationship between time series variables. The results show that structural change statistically significantly affects economic growth in Nigeria over the sample periods. Thus, the study recommends that government policies that drive structural change in the three sectors, agriculture, manufacturing and services must be encouraged in order to continue to grow the economy.

Keywords: Economic Growth, Structural Change
JEL Classification Codes: O10, O40

1. Introduction

Economic activities of any nation in the globe are directly or indirectly influenced by their surrounding location through changes in resources; labor, knowledge and information, inter-regional trade, and flow of capital (Hazrana, Birthal, Negi, Mani & Pandey, 2019). These changes affect not only sectoral performance like agriculture, manufacturing and services but also economic growth. Changes in resources, all things being equal, usually determined by the movement of labour from primary sector (agricultural sector) to non-primary sector (i.e., manufacturing and service sectors) is referred to structural change.

Structural change which is the reallocation of economic activities from traditional sector (agricultural sector) to modern sector (both manufacturing and service sectors) especially as it affects economic growth has become a major concern (Dabús & Delbianco, 2021). De Vries and Timmer (2014) pointed out that as labor and other resources move to modern economic activities, total productivity increases as well as income. The work of Lewis (1954) clearly indicates a distinction between the traditional and modern sector. According to him accumulation, innovation, and productivity growth are taken place in the modern sector, while the traditional sector remains technological backward and stagnant. It has been observed that economic growth largely depends on the rate at which resources particularly labor can move from the traditional to modern sector. This is because; most of the world economies are largely characterized by structural dualism.

Mcmillan, Rodrik and Sepulveda (2017), equally explain that an economy grows when labor and other resources move from less productive to more productive activities. As such, structural change removes constraints from productivity growth. In addition, shift in the sectoral component in respect to whether in employment or value added (output) share in an economy are usually regarded as structural change which on the other hand, are the essential conditions for economic growth (Ahson, Muhammad & Sarwar, 2017).

It is against this background, that this study seeks to investigate the impact of the structural change on economic growth in Nigeria. The study differs from the empirical evidences for the fact that it examines the dynamic relationship between the structural change and economic growth using the value-added share as a proxy for the structural change. The paper, thus, can be viewed as additional evidence examining the alternative nature of relationship between structural change and economic growth. The rest of the paper is organized into the following sections. Section 2 provides a review of the literature which includes both theoretical and empirical literature. Section 3 is the methodology of the study, where the data and the model are outlined. While section 4 presents and discusses the estimation results, finally in section 5 is the conclusion and recommendations of the study under investigation.

2. Literature Review

2.1 Theoretical Literature

Lewis (1954) theory of Structural Change tries to explain the growth of a developing country in terms of labor transition between two sectors. As a result of this, his theory is sometimes also called the dual economic theory. It focuses on labor being transferred between two sectors: the Agricultural and industrial Sector. The Agricultural Sector according to Lewis, land is limited and mainly has to do with agricultural produce such as crops, grains, among others. There is an unlimited supply of labor with low or sometimes even zero marginal productivity of additional labor. Wage at this level is rated at the subsistence level.

The Industrial Sector which is also refers to modern, manufacturing or industrial sector is said to be expansionary in nature. It is growing in nature. The main motive in this sector is to maximize profit by charging a price higher than the set wages. It focuses on more profits and higher wages. The wage that is provided under this sector is higher than what is provided in the agricultural sector. As a result, it serves as an incentive for the labor to migrate from the agricultural sector to the industrial sector. Structural Change therefore sees economic development as a set of interrelated structural changes. This mainly has to do with the move from being an underdeveloped country to a developed country.

2.2 Empirical Literature

The empirical evidence in respect to the relationship between structural change and economic growth irrespective of national or regional level is inconclusive (Laitner, 2000; Fan, Zhang & Robinson, 2003; Noseleit, 2013; Cheng, 2019; Comin, Lashkari & Mestieri, 2021). This is due to the changes that are frequently taking place in the broad sectors of the economy. Among other empirical studies for example, Dabus and Delbianco (2021) examine the role of services between economic development and structural change among 39 advanced and developing countries. Using both cross-section and panel regressions, the study highlights the effect of the expansion of the service sector on economic growth confirming the intuition that services may be harmful for economic growth (Rodrik, 2016).

In a related study, Aggarwal (2018) investigates the relationship between the economic growth, structural change and productive employment in India using the Job Generation and Decomposition (JoGGs) tool of the World Bank. The study shows that structural change contributes negatively to employment resulting to decrease in economic growth, since employment opportunities are not being created in high productivity sectors and segments. Analyzing structural transformation using the JoGG tool can be seen in Ajakaiye, Jerome, Nabena & Alaba (2016); Byiers, Berliner, Guadagno & Takeuchi (2015); Bbaale (2013); Malunda (2013) among others. Similarly, Diao, McMillan and Rodrik (2017) revealed that structural change contributes negatively to overall economic growth but with the exception of agriculture.

The studies of both Busse, Erdogan and Muhlen (2017) and Tehle (2012) indicate that the relationship between structural change and economic growth and development is significant. The findings of These studies fail to identify whether the relationship is positively or negatively significant. But Sanyal and Singh (2020) and Vivarelli (2018) find out that structural change positively influences economic growth. However, the result of the study of Ahson, Muhammad, and Sarwar (2017) indicate also that there is positive but insignificant relationship between structural change and economic growth of SAARC region. The study provides the evidence that structural change is not significantly a determinant of economic progress.

The finding of the study contradicts with that of Ardiansyah, Diartho, and Lestari (2020) whose finding shows that structural change is a major and significant determinant of economic growth. That the contribution of structural change to economic growth is not merely as a result of the movement of labor across sectors but also due to an increase in productivity. Although Magacho (2016) equally argued that long-term economic growth is related to structural changes, the study fails to address the dynamics with which structural changes affects long term growth.

3. Methodology

Annual time series data on value-added shares of agricultural sector ($Agric_t$), manufacturing sector ($Manu_t$), service sector ($Serv_t$) and a measure of the Nigerian economic growth, real GDP growth (GDP_t), are employed for the empirical analysis. The dataset for period from 1980 until 2021 is obtained mainly from the World Bank's World Development Indicator (WDI). Since the value-added shares of agricultural sector, manufacturing sector and service sector are all proxies for the structural change, the method of principal component analysis (PCA) is applied to construct a single indicator of the structural change.

3.1 Model Specification

In order to investigate the impact of structural change in the agricultural sector, manufacturing and services on Nigerian economic growth, this study employs an autoregressive distributed lags ARDL model. The model, single-equation model, has been used for decades in modelling the relationship between time series variables:

$$y_t = c_0 + c_1 t + \sum_{i=1}^{p} \emptyset_i y_{t-i} + \sum_{i=0}^{q} \beta'_i x_{t-i} + u_t \qquad 1$$

for $p \geq 1, q \geq 0$, where y_t is dependent variable, u_t is the innovation term, p and q are lags of the dependent and independent variables in the model, respectively. Following the above equation, the relationship between economic growth and structural change in Nigeria can be expressed in the form:

$$GDP_t = c_0 + c_1 t + \sum_{i=1}^{p} \emptyset_i GDP_{t-i} + \sum_{i=0}^{q} \beta'_i Strucc\square ng_{t-i} + u_t \qquad 2$$

Since an ARDL model has a reparameterization in error correction EC form, it can disentangle the short run dynamics from long run relationships in the case the variables are nonstationary and cointegrated.

$$\Delta y_t = c_0 + c_1 t + \alpha(y_{t-1} - \theta x_t) \sum_{i=1}^{p-1} \psi_{yi} \Delta y_{t-i} + \sum_{i=0}^{q-1} \psi'_{xi} x_{t-i} + u_t \qquad 3$$

with the speed-of-adjustment coefficient $\alpha = 1 - \sum_{j=0}^{p} \phi_i$ and the long run coefficients

$\theta = \frac{\sum_{j=0}^{q} \beta_j}{\alpha}$. A bound testing procedure, according to Pesaran, Shin and Smith (2001), is applied to draw conclusive inference about the existence of cointegration (long run relationship) among the variables without knowing whether the variables are integrated of order zero or one, $I(0)$ or $I(1)$, respectively. In the case where the bounds test fails to reject the null of no long run relationship among the variables, an ARDL model purely in first differences is estimated.

4. Results and Discussion

To conduct the analysis, this section presents first, the series plots of the study variables as well as the summary statistics. The distribution of the annual growth of the real GDP in Fig. 1 is characterized by both a positive and negative growth over the period from 1980 until 2020. A similar behavior can be observed for the structural change indicator. The series plot show fluctuation of the variable over the sample period from 1980 until 2020.

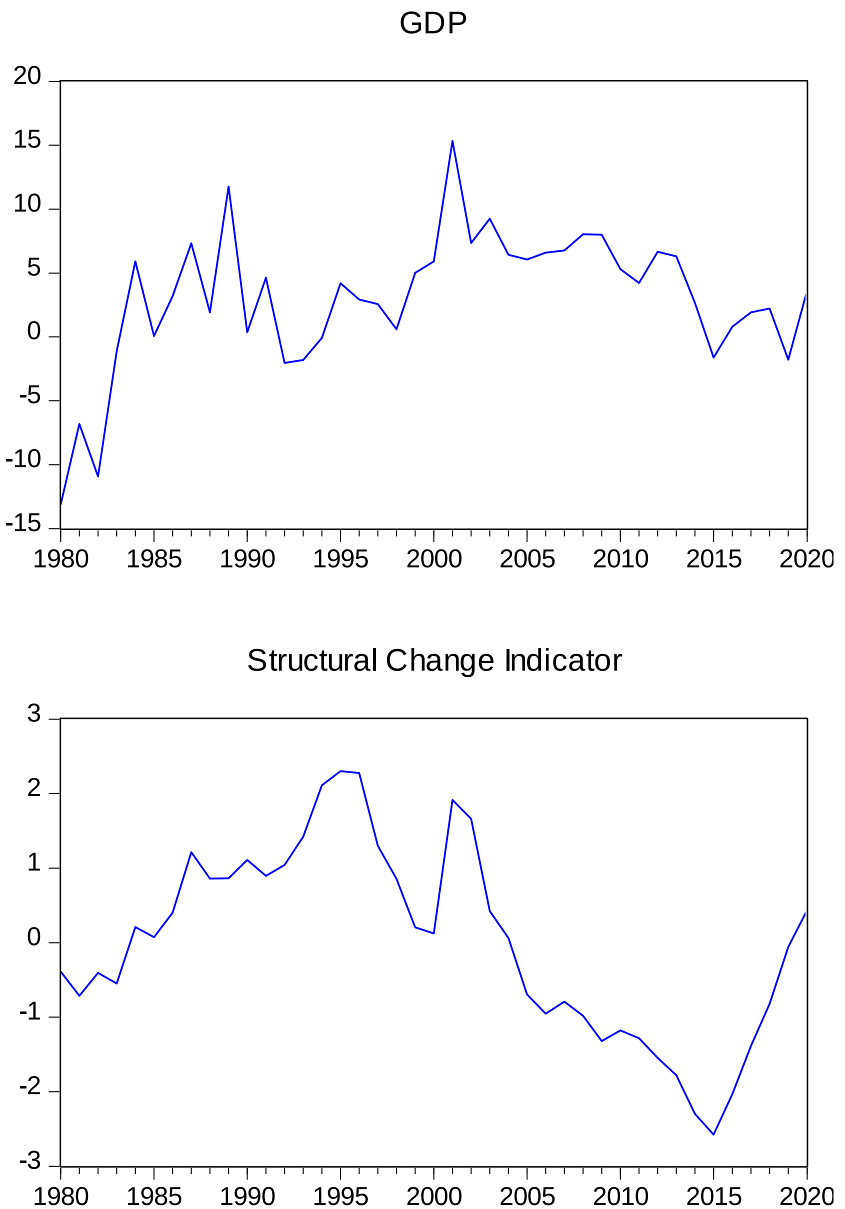

Figure 1: Time Series Plots of the Study Variables
Source: Authors' compilation

Table 1 below presents the summary statistics of the above variables, real GDP growth (GDP_t) and the structural change indicator ($Strucc$□g_t).

Table 1: Summary Statistics

Statistic	GDP_t	$Strucchg_t$
Mean	3.0415	0.0000
Median	3.6472	0.0717
Maximum	15.3292	2.2996
Minimum	-13.1279	-2.5756
Std. Dev.	5.3854	1.2824
Skewness	-0.8192	-0.0282
Kurtosis	4.6206	2.1830
Jarque-Bera	9.0722**	1.1457
Obs.	41	41

Note: **5% significance level
Source: Authors' computation

To check the presence of breaks in the series, the Bai and Perron test is conducted for both series. Bai and Perron (1998, 2003) extend the Quandt-Andrews framework for identifying the presence of structural break by allowing for multiple unknown breakpoints. The null hypotheses of 0, 1, and 2 etc., breakpoints are rejected under the Bai-Perron test of $L+1$ versus L sequentially determined breaks if the scaled F-statistic is larger than the Bai-Perron critical value for the scaled statistic.

Table 2: Bai-Perron Test Of *L+1* Versus *L* Sequentially Determined Breaks

	Break Test	Scaled F-statistic	Critical value	Break dates
GDP_t	0 vs. 1	19.1622***	8.58	1986
	1 vs. 2	4.9037	10.13	
$Strucchg_t$	0 vs. 1	57.2482***	8.58	1987
	1 vs. 2	34.6692***	10.13	2005
	2 vs. 3	3.8684	11.14	

Note: (*) denotes that the scaled F-statistic greater than the critical value
Source: Authors' computation

The sequential test results in Table 2 indicate one breakpoint in the real GDP growth and two in the structural change indicator. The null hypothesis of 0 breakpoint in the real GDP growth is rejected in favor of the alternative of 1 breakpoint with the break date observed around 1986. Whereas, the null of 0 and 1 breakpoints in the structural change indicator is rejected in favor of the alternative of 2 breakpoints with the break dates observed around 1987 and 2005.

In the presence of breaks in the series, the application of the standard unit root tests may not be appropriate. A well-known weakness of the standard unit root tests is their failure to reject the null of unit root if the series have a structural break. The Zivot-Andrews (1992) unit root test with a single structural break is used to check the stationarity of the real GDP growth (GDP_t) and structural change indicator ($Strucc\square ng_t$). The null hypothesis that the series has a unit root with structural break(s) against the alternative hypothesis that it is stationary with break(s) is rejected if the Zivot-Andrews test statistic is less than 0.05.

Table 3: Zivot-Andrews Unit Root Test in the Presence of Break: Level

No	Indicators	Zivot-Andrews statistic	Result
1	GDP_t	-3.5124***	I[0]
2	$Struc\square ng_t$	-3.6156***	I[0]

Note: (*) denote the rejection of the null at the 1% significance level
Source: Authors' computation

From Table 3 the results of the unit root test with Zivot-Andrews indicate that both GDP_t and the $Strucc\square ng_t$ variables are stationary at levels. The null of a unit root in the series is rejected under the Zivot-Andrews statistic for both variables at the 1% significance level which indicates that the series are I(0). Given the order of integration of the variables, cointegration of the series is examined. The appropriate cointegration test, where the variables under investigation are $I(0)$s or $I(1)$s series or a mixture of both $I(0)$ and $I(1)$ series is the bounds testing cointegration of Pesaran et al (2001). The null hypothesis of no level relationship between the variables is rejected if the test statistics fall below the lower bounds. The results from the bounds test are presented in Table 4.

Table 4: Bounds Test for Co-integration

Statistic	Value	Sign.	Lower	Upper
$\boldsymbol{F}$-statistic	1.9648	10%	3.02	3.51
$\boldsymbol{K}$	1	5%	3.62	4.16
		2.5%	4.18	4.79
		1%	4.94	5.58

Note: the null hypothesis: no level relationship
Source: Authors' computation

The test results show that the null hypothesis of no level cointegration of the series cannot be rejected at all levels of significance, since the F-statistic (1.9648) is smaller than the lower bounds, indicating that all the variables are I(0) and not cointegrated. If the bounds test fails to reject the null of no level relationship among the variables, an ARDL model in first differences may be estimated. Given the results from Table 4, the ARDL model without an equilibrium correction term is estimated to analyze the relationship between real GDP growth and the structural change and the results presented in Table 5.

Table 5: Estimated ARDL Model of the relationship between GDP and Structural Change in Nigeria

GDP	ARDL model (2, 1)	Standard error
$\mathbf{GDP_{t-1}}$	0.2438	0.1507
	(1.618)	
$\mathbf{GDP_{t-2}}$	0.4425***	0.1434
	(3.085)	
Strucchng	2.5050**	1.2078
	(2.074)	
$\boldsymbol{Strucchng_{t-1}}$	-2.1200*	1.1920
	(-1.778)	
Constant	1.4020*	0.7610
	(1.842)	
R-squared	0.8221	
Adj R-squared	0.8021	
F-statistic	6.2084***	
Models (evaluated)	20	
Nos. of Obs. (adjusted)	39	

Note: ***1%, **5% and *10% level of significance
Source: Authors' computation

An ARDL (2, 1) model is estimated for the analysis based on the Akaike information criteria (AIC) for optimal lag order selection. The optima lag (2, 1) is selected following a total number of 20 optimized lag combinations. The optimal model is the one with the smallest value of the AIC. From Table 5 it is observed that the estimated coefficients of the of the explanatory variable including the lag of the dependent variable two periods ago are positive and highly statistically significant at the 5% and 1% level of significance, repectively. This means that structural change singnificantly impacted GDP in Nigeria. The magnitude of the coefficient of the structural change is quite high indicating that structural change largely affects the GDP in Nigeria. The coefficient of the lag of the GDP one period ago however shown to be statistically insignificant, while the coefficient of the lag of the structural change one period ago is observed negatively but statistically significant at the 10% significance level.

The values of the R^2 and adjusted R-squared of the estimated model near 1, suggesting a good fit. Values equal to 1 imply that the model is a perfect fit. For the above estimated model the values of R^2 = 0.82 and the adjusted R-squared = 0.80 are quite high and close to one, indicating that the fit of the regression line is good. That is to say, 82% (or 80% in the case of the adjusted R-squared) of the overall variation in GDP can be explained by the independent variable including the lags of the GDP and the lag of the explanatory variable. The F-test (6.208) of overall significance of the model's fit to the data is equally statistically significant, indicating that, collectively, all the variables have a significant impact on GDP.

The validity of the above estimated ARDL (2, 1) model relies on normally distributed error terms that are homoscedastic and serially uncorrelated as well as stability of the coefficients over time. Postestimation diagnostic tests with Breusch–Godfrey LM test for higher-order serial correlation in the residuals, Breusch-Pagan/Cook-Weisberg tests for heteroscedasticity and CUSUM test of the parameter stability are employed to judge the accuracy of the estimated model. The results in Table 6 below present the Breusch–Godfrey LM test for serial correlation in the residual. The Breusch–Godfrey test is an LM test of the null hypothesis of no autocorrelation of the random term. The test can detect autocorrelation up to any prespecified order p. The null of no serial correlation is rejected if the p-values are smaller than 0.05 for all the lags.

Table 6: Breusch-Godfrey LM test for Autocorrelation

F-statistic	1.5575	Prob. F	0.2262
Obs*R-squared	3.4597	Prob. X^2	0.1773

Note: Null hypothesis: no serial correlation. The null cannot be rejected since the prob. values are greater than 0.05 at all lags.
Source: Authors' computation

Under the present analysis, the null of no serial correlation cannot be rejected under both the F and Obs*R-squared test statistics since the p-values are larger than the 0.05 level of significance indicating that the residual is serially uncorrelated and the model is free from the problem of autocorrelation. The Breusch-Pagan/Cook-Weisberg tests designed to detect any linear form of heteroskedasticity are equally estimated. The null hypothesis of no heteroskedasticity of the error term is rejected if the probability values under the F, Obs*R-squared and LM test statistics are smaller than 0.05. The test results in Table 7 below show that the null however, cannot be rejected since the probability values are larger than 0.05 which indicate that the residual is homoscedastic and the model is free of the problem of heteroscedasticity.

Table 7: Breusch-Pagan & Cook-Weisberg Test for Heteroskedasticity

F-statistic	2.6285	Prob. F	0.0514
Obs*R-squared	9.2116	Prob. X^2	0.0560
LM-statistic	5.6679	Prob. X^2	0.2254

Note: Null hypothesis: constant variance. The null cannot be rejected if the prob. value is insignificant.
Source: Authors' computation

To test the above coefficients of the estimated ARDL (2, 1) model for stability over time, the Cumulative Sum (CUSUM) test of the recursive residual is computed. The test of parameter stability of the model based on the CUSUM of recursive residual is depicted in Figure 2. The null hypothesis that all parameters are stable or constant over the sample period is rejected if the test statistic is larger than the critical value or if the CUSUM plot lies outside the confidence bands.

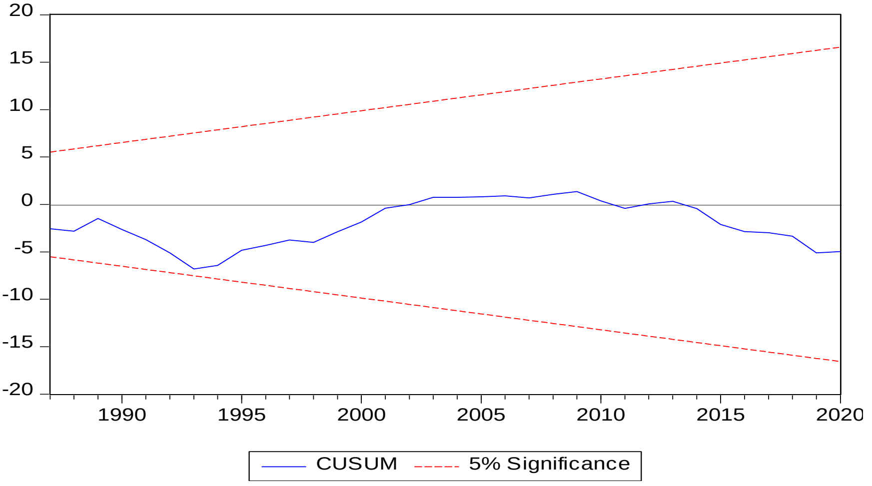

Figure 2: CUSUM test of the Parameter Stability of the ARDL (2, 1) Model
Source: Authors' computation

From Figure 2, it is shown that the CUSUM of the recursive residual lies strictly within the 95% critical bands which indicate that the estimated model parameters are stable over the sample period.

5. Conclusion and Recommendations

This study investigates the impact of structural change on economic growth in Nigeria in the three sectors namely, agriculture, manufacturing and services, using annual data from 1981 to 2021. The ARDL model is employed to analyze the relationship between the real GDP growth and structural change indicator for the three sectors. To measure structural change in the three sectors, data on value-added share from each sector is used to construct a single indicator using principal component analysis (PCA). The analysis confirms that the structural change impact GDP in Nigeria. The value-added share in the three sectors contribute to aggregate growth in Nigeria. The value-added share of the service sector which can affect income levels affect GDP per capita and therefore growth. Looking at the manufacturing sector, the value-added share affect prodctivity which can affect GDP per capita. While the value-added share in agriculture affect output level which can affect growth. Over the years structural transformation across the different sectors of the Nigerian economy may have accelerated growth.

Thus, the study recommends that government policies that drive structural change in the three sectors, agriculture, manufacturing and services must be encouraged in order to continue to affect the productivity, income levels and output which affect the growth rate of the economy.

References

Aggarwal, A. (2018). Economic growth, structural change and productive employment linkages in India: Did market transition matter? *South Asia Economic Journal*, *19*(1), 64-85.

Ahson, U. S., Muhammad, W., & Sarwar, S. (2017). Structural transformation and economic growth: A fresh empirical assessment of SAARC countries. *The Pakistan Journal of Social Issues*, *8*, 21-31.

Ajakaiye, O., Jerome, A. T., Nabena, D., & Alaba, O. A. (2016). Understanding the African Lions-growth traps and opportunities in six dominant African economies-understanding the relationship between growth and employment in Nigeria.

Ardiansyah, F., Diartho, H. C., & Lestari, E. K. (2020). Structural transformation of agriculture and poverty in Indonesia. *Wiga: Jurnal Penelitian Ilmu Ekonomi*, *10*(1), 1-12.

Bbaale, E. (2013). Is Uganda's growth profile jobless? *International Journal of Economics and Finance, 5*(11), 105.

Bai, J., & Perron, P. (2003). Critical values for multiple structural change tests. *The Econometrics Journal*, *6*(1), 72-78.

Bai, J., & Perron, P. (1998). Estimating and testing linear models with multiple structural changes. *Econometrica*, 47-78.

Cheng, C. Y. (2019). *China's economic development: Growth and structural change*. Routledge.

Comin, D., Lashkari, D., & Mestieri, M. (2021). Structural change with long- run income and price effects. *Econometrica*, *89*(1), 311-374.

Byiers, B., Berliner, T., Guadagno, F., & Takeuchi, L. R. (2015). Working for economic transformation. *ODI Dimension Paper*, *3*.

Dabús, C., & Delbianco, F. (2021). Economic development and structural change: The role of services. *Journal of Economic Development*, *46*(3), 65-84.

De Vries, G., Timmer, M., & De Vries, K. (2015). Structural transformation in Africa: Static gains, dynamic losses. *The Journal of Development Studies*, *51*(6), 674-688.

Diao, X., McMillan, M., & Rodrik, D. (2017). *The recent growth boom in developing economies: A structural change perspective* (No. w23132). National Bureau of Economic Research.

Fan, S., Zhang, X., & Robinson, S. (2003). Structural change and economic growth in China. *Review of Development Economics*, *7*(3), 360-377.

Hazrana, J., Birthal, P. S., Negi, D. S., Mani, G., & Pandey, G. (2019). Spatial spill-overs, structural transformation and economic growth in India. *Agricultural Economics Research Review*, *32*(2), 145-158.

Laitner, J. (2000). Structural change and economic growth. *The Review of Economic Studies*, *67*(3), 545-561.

Lewis, W. A. (1954). Economic development with unlimited supplies of labour. *The Manchester School,* 22(2), 139-191.

McMillan, M., Rodrik, D., & Sepulveda, C. (2017). *Structural change, fundamentals and growth: A framework and case studies* (No. w23378). National Bureau of Economic Research.

Magacho, G. R. (2016). Structural change and growth: a survey on alternative approaches. Working paper

Malunda, D. (2012). Employment intensity of non-agricultural growth in Rwanda: Analysing the links between growth, employment and productivity. *IPAR, Rwanda*.

Noseleit, F. (2013). Entrepreneurship, structural change, and economic growth. *Journal of Evolutionary Economics, 23*(4), 735-766.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics, 16*(3), 289-326.

Rodrik, D. (2016). Premature deindustrialization. *Journal of economic growth*, *21*(1), 1-33.

Sanyal, A., & Singh, N. (2021). Structural change and economic growth in India: a comparative study of Punjab. *Indian Growth and Development Review*.

Těhle, V. (2012). *Structural change in the course of economic development*. [Unpublished bachelor thesis]. Charles University in Prague.

Vivarelli, M. (2018). Globalization, structural change and innovation in emerging economies: The impact on employment and skills. *Available at SSRN 3261708*.