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Structural Change and Its Implications on Productivity Growth in Sub Saharan Countries

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Abstract

Structural changes indicate the reallocation of inputs from less productive to more productive sectors. The main purpose of this study is to examine the determinants of structural change and its effect on productivity growth in SSA based on 17 sample countries. The data sources used in the study were the Groningen Growth and Development Center database, the WDI database, and the UNDP data center. The study uses output and employment by applying shift-share decomposition analysis to compute structural change. The Generalized Methods of Moments (GMM) approach examines determinants of structural change to estimate the effect of structural change on productivity growth. We found that a country's initial conditions of agricultural employment, access to domestic credit, trade openness, GDP growth, and the mean year of schooling positively influence the pace of structural change, but inflation has a negative effect. The study's findings indicate the existence of growth-promoting structural change in the SSA area, indicating that structural change has a beneficial impact on overall productivity growth; services were the dominant engine of economic growth and the leading catalyst for structural change in terms of sectoral dynamics. Even though structural change can promote growth in the SSA region, there is a tendency to decrease employment productivity growth in expanding industries. In addition, the study reveals that in certain industry subsectors, the percentage of total employment and productivity in the region is falling. For these, productivity levels might rise and development could increase if measures are targeted to improve this sector's access to financing, machinery, and equipment.

Keywords: Structural Change, Productivity Growth, SSA, Decomposition, System GMM

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Introduction

There are basically two approaches to exploring growth sources. The first is a production frontier kind of study, which is often linked with a decomposition of a productivity growth index into its sources of technological progress and technical efficiency change. The other approach focuses on using growth accounting applications. Even though growth accounting is often the foundation for source-of-growth analysis with decompositions into factor accumulation and total factor productivity (TFP) growth, economic growth may also be decomposed into its sectoral components. These may be split into the contribution of the sector itself and changes to the entire composition of the sector, namely, structural change (Isaksson, 2010). Structural change is the economy shifting from the existing structure to the new structure, where output and employment share in GDP and contribute to growth (Johnston & Park, 1995).

The economic literature's inseparable companion of the growth process is termed structural change (Gabardo et al., 2017). The process may take the form of output or employment. Through the process, the relative shares of agriculture, industry, and service sectors in the economy in terms of value-added and employment creation will shift (Oyelaran-Oyeyinka, 2017). Kuznets and Murphy (1966) also established larger definitions of structural change, including changes in other parts of society and changes in the economic structure like production and employment. For example, structural change may comprise a spatial population reorganization caused by rural-urban mobility and demographic change caused by decreasing fertility rates. It is also marked by the shift in the workforce from labor-intensive to skill-intensive activities.

A common definition of productivity is the input volume to output volume ratio. In other words, it assesses how effectively an economy uses labor and capital as production inputs to produce a particular amount of output (Krugman, 1997). In this regard, this study used labor and total output to measure the level of productivity.

Literature has identified productivity growth as a critical component of the economic development process. Agriculture is believed to have a limited ability to apply technology and innovations indefinitely due to the scarcity of land and other production inputs. In contrast, the manufacturing and service sectors are not embarrassed by such factors. As a result, advancements in technology and worker skills increase productivity in manufacturing and services more than in agriculture, implying that much use of technology and increased productivity in these two main sectors are the fundamental driving forces for an economy to progress (Lewis, 1954).

In connection to this, this study is intended to evaluate the structural change effect on productivity growth in SSA countries, including Botswana, Burkina Faso, Cameroon, Ethiopia, Ghana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Nigeria, Senegal, South Africa, Tanzania, Uganda and Zambia based on shift-share growth decomposing approach correspondingly analyzed estimate its effect through econometric techniques.

In this regard, the history of developed countries also demonstrates such a path. They have historically evolved from agrarian cultures to industrial societies and service-based economies. The question of whether this is the best path for today's emerging countries is widely contested. Agriculture has lower labor productivity than the nonagricultural sector in developing countries (Gollin et al., 2014). This shows that shifting labor from agriculture to industry would significantly impact overall productivity and economic growth. However, as automated (labor-saving) technologies are introduced and workers leave the sector, agricultural output is expected to rise. Manufacturing is usually regarded as a critical area for driving productivity because of its rising returns to scale, high tradability, and strong backward and forward links to agriculture and services (Schwarzer, 2013; UNIDO, 2013). While the sector has undoubtedly contributed to today's industrialized countries' development, rising automation levels may be limiting its ability to absorb significant numbers of workers (Rodrik, 2016; Kucera & Roncolato, 2016).

Developing countries must also go through the process of reallocating labor from traditional, low-productivity sectors of the economy to modern, high-productivity sectors to achieve high aggregate levels of productivity (Chenery, 1979; Jones, 1965; Lewis, 1954). While all economies go through structural change, the speed and direction of change distinguish industrialized from developing countries. Overall productivity increases only when labor shifts from less productive to more productive industries, which is known as a structural bonus (Baumol, 1967). However, if labor flows from more productive to less productive sectors, structural change will be negatively correlated with overall productivity, resulting in structural burden, which is the opposite of structural bonus (Fagerberg, 2000; Maddison, 1987; McMillan et al., 2014).

Productivity growth and economic development for developing nations like SSA are crucial issues. In this region, poverty, inequality, and unemployment continue to be challenges. Though, since the early 2000s, many African countries have had considerable economic growth, especially the eastern part of Africa, which registered remarkable growth with an average annual growth of GDP of 6.6 percent (UNECA, 2020), fast economic growth may not produce equivalent socioeconomic gains, and present growth rates may be difficult to maintain (McKay, 2013; Rodrik, 2016). Moreover, this last decade's remarkable growth has a limitation in terms of structural change; as a result, the industrial sector remains a small contributor to GDP, at about 18 percent. Particularly, the smaller share of the manufacturing sector, which is a subset of the industry, illustrates the insufficiency even more (AfDB, 2018).

Though SSA counties have registered remarkable growth over the last two decades and the region is among the fastest in economic growth globally, no prior research has attempted to estimate the level of impact of structural change, and even if there were, the degree of inclusion of countries and sectors in their study was quite narrow. As a result, this research aims to fill the gap by conducting an empirical investigation of the determinants of structural change and its effect on productivity growth in SSA with an extended sample and disaggregated sectors. This study contributes to the existing literature by providing an empirical assessment of the patterns of productivity growth and structural change in SSA for the period between 1990 and 2018 and the level of structural change's effect on productivity growth. Furthermore, the issue of the drivers of productivity growth is still being debated; therefore, the significance of this study is to incite and contribute to clearing the way for future research in the field. Moreover, the immediate result serves as a benchmark for policymakers. Further, the study also opens pathways for future scholars to undertake similar studies.

Several empirical studies attempt to validate the link between structural change, productivity, and growth. But a solid conclusion cannot be made as of yet since the research yields inconsistent findings (Vu, 2017). A research-based decomposition approach divides overall productivity growth into changes due to within-sector productivity increase, i.e., within effects, and changes due to labor reallocation across sectors, i.e., between effects or structural change effects. Most research, including McMillan et al. (2014) and Padilla-Perez and Villarreal (2017), found that the within effect was more significant than the structural change effect in delivering improvements in aggregate productivity. However, Hasan et al. (2013) and Nguyen (2018) found that the two components contributed differently to aggregate productivity growth.

The empirical literature findings based on regression analysis are also diverse and ambiguous. Cortuk and Singh (2011), for instance, discovered a causal relationship between structural change and productivity growth.

A study conducted by Nuhu (2017) using data from 1980 to 2010 indicates that the share of employment in agriculture in the initial estimation period positively impacts structural change. This refers to the fact that a country's initial agricultural employment conditions can influence structural change and growth rate. For example, given the large productivity gaps observed between agriculture and the remaining economic sectors, countries with a high share of employment in agriculture have (at least in theory) a greater opportunity to benefit from employment reallocations. As these gaps close over time, the potential for reallocation gains diminishes (Martins, 2019).

In theory, more financial development might speed up structural change more than productivity growth. Indeed, financial development encourages saving and capital reallocation to a critical mass of firms (Da Rin & Hellmann, 2002; Gui-Diby & Renard, 2015). However, according to the literature, inflation negatively affects productivity growth. Inflation distorts perceptions of relative price levels, resulting in poor investment decisions and a negative impact on productivity. Clark (1982), Rudebusch, and Wilcox (1994) have found a substantial inverse relationship between inflation and productivity in the United States. It was argued that decreasing inflation would boost productivity (Rudebusch & Wilcox, 1994). Furthermore, GDP growth influences structural change on the demand side, as incomes rise and production activities follow (Nayyar, 2019). However, structural change also positively affects economic growth as labor shifts from low-productivity to higher-productivity sectors, driving economic growth from the supply side (Nayyar, 2019).

Methodology of the Study

The study uses three main sources of data: the Groningen Growth and Development Center (GGDC) twelve-sector database, the World Bank's WDI database, and the UNDP data center. The data is panel data for the period between 1990 and 2018 extracted from 17 sample countries, specifically Botswana, Burkina Faso, Cameroon, Ethiopia, Ghana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Nigeria, Senegal, South Africa, Tanzania, Uganda, and Zambia in the region. The data covers the twelve major sectors (unless otherwise stated) comprising the whole economy as defined by the International Standard Industrial Classification of All Economic Activities (ISIC Rev. 4). In this study, the researcher aggregated these 12 sectors into three main sectors to show the result at the main sector level and the sub-sectoral level.

The study uses MS Excel, OriginPro 2022, and STATA 17.0 as the analysis tools. The analysis has two parts (descriptive and empirical analysis). The descriptive part of the analysis shows the value output and employment trend and the result of growth shift-share decomposition. In the empirical part of the analysis, we use econometric models to examine the determinants of structural change and estimate the effect of structural change on productivity growth.

Productivity Decomposition

The study computed sectoral productivity using annual time series data (1990-2018) on value-added and employment shares in each sector, as described by Fagerberg (2000). Hence, productivity P_{it} for each industry at time t, is computed as the value added in 2015 constant dollars per worker.

$$P_{it} = \frac{y_{it}}{l_{it}} \tag{1}$$

Where; l_{it} is employment share of sector i at time t and y_{it} is the value-added of sector i at time t. Then overall productivity P_t is computed as a weighted aggregate of the productivity levels for all sectors at a time (equation (2)).

$$P_t = \sum_{i,t=1}^{n} P_{it}\,\delta_{it} \tag{2}$$

Where; the weight, δ_{it} is employment share of sector i at time t.

$$\delta_{it} = \frac{l_{it}}{\sum l_{it}}$$

The growth rate of aggregate labour productivity between time 0 and t may be due to with-in-sector labor productivity, between-sector productivity growths, and dynamic sources.

Thus, in this study, the paper follows the second argument of the productivity determination approach, the method used by Fagerberg (2000), to see the full picture of productivity growth. Fagerberg used the following formula while determining total labour productivity growth.

$$\frac{\triangle P}{P_0} = \sum_{i=1}^{n} \left(\frac{P_{i0}(\delta_{it} - \delta_{i0})}{P_0} + \frac{\delta_{i0}(P_{it} - P_{i0})}{P_0} + \frac{(P_{it} - P_{i0})(\delta_{it} - \delta_{i0})}{P_0} \right) \quad (3)$$

Where P is aggregate productivity growth, is obtained from equation (2), P_t is aggregate productivity in the end year, t, and P_0 is aggregate productivity in the base year, o. On the other hand, P_{i0} is sector i productivity in the base year while P_{it} is the productivity of sector i in the end year. δ_{i0} is employment share of sector i in the base year, and δ_{it} is the end period employment share of sector i.

The first part of the equation indicates the static shift effect or employment effect. This term will be positive if employment share changes are positively related to productivity levels. It is positive (or negative) if higher-productivity industries attract more (or fewer) labor resources, increasing (or decreasing) their proportion of total employment. The second term indicates within-sector productivity growth; this component shows how each sector's productivity growth contributes to overall labor productivity growth. The third term is the interaction effect due to employment and productivity changes, which might be used to test Baumol's (1967) structural bonus or burden theory. The idea is that this part will remain negative when employment shifts from more productive to less productive sectors.

Econometric Analysis Models

Analyzing the determinants of structural change and examining its effect on productivity growth empirically are among our study objectives. Hence, we use two models in our empirical analysis. We use model 1 to analyze determinants of structural change. Besides, we use model 2 to analyze the effect of structural change on productivity growth.

Model 1: Determinates of structural change

$$SC_{it} = \beta_0 + \gamma SC_{it-1} + \beta_1 \text{AgrEMP}_{it} + \beta_2 DC_{it} + \beta_3 TO_{it} + \beta_4 \text{GDPGr}_{it} + \beta_5 \text{Inflation}_{it} + \beta_6 \text{MYS}_{it} + \beta_7 \text{LE}_{it} + u_{it}$$

Where i represent the country ($i = 1, 2, 3, \ldots$, N), and t represents the time ($t = 1, 2, 3, \ldots$, T). SC_{it} denotes current period structural change and SC_{it-1} is the lagged dependent variable of the structural change, and because of suspicion of the existence of a dynamic relationship, it is used as a regressor with" γ" as its parameter. β_0 is constant term, $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6,$ and β_7 are the coefficient of the explanatory variables Agricultural share of employment at the beginning of the period (AgrEMP), Domestic credit to private sector (DC), Trade openness (TO), GDP growth (GDPGr), Inflation, Mean year of schooling (MYS) and Life expectancy (LE) respectively and u_{it} is the error term.

Model 2: effects of structural change on productivity growth

$$PG_{it} = \beta_0 + \gamma PG_{it-1} + \beta_1 SC_{it} + \beta_2 WE_{it} + \beta_3 \text{Govsize}_{it} + \beta_4 Goveffectiveness_{it} + \beta_5 lnPoP_{it} + u_{it}$$

PG_{it} denotes current period productivity growth and PG_{it-1} is the lagged dependent variable of the productivity growth, and because of suspicion of the existence of a dynamic relationship, it is used as a regressor with" γ" as its parameter. The structural change (SC) is our main variable in this model and the remaining are control variables. β_0 is constant term, $\beta_1, \beta_2, \beta_3,$ and β_4 are the coefficients of Structural change (SC), Within effect (WE), Government size, Government effectiveness, and Population size (lnPoP) respectively.

In estimating growth, the researchers encounter a significant difficulty of endogeneity (Opoku & Yan, 2018). According to Opoku and Yan (2019), the instrumental variable methodology is a common way of dealing with the endogeneity problem. They pointed out that using this technique to estimate structural change can aid in the discovery of causes as long as the instruments used have no direct effect on structural change and only have an indirect effect via the endogenous variable. However, they did point out that this strategy is not without flaws. This is because the variables used as instruments frequently have limited power to describe endogenous factors (Bound et al., 1995). As a result, regression estimations based on these instruments may be inconsistent. In recent decades, academics have created an approach known as GMM, which uses the endogenous variables' own delays as instruments to address endogeneity and unobserved heterogeneity (Roodman, 2009a). As a result, the current study chose the GMM estimator (Opoku & Yan, 2019; A. A. C. Teixeira & A. S. S. Queirós, 2016), as did other studies (e.g., Teixeira & Queirós, 2016; Vu, 2017; Opoku & Yan, 2018).

GMM estimators are classified into two types: "difference GMM' and "system GMM". The difference GMM converts the equation into first differences to remove the fixed national effects. These 'differences' are then instrumented with the lagged values of the endogenous variables.

To create a system of two equations, the system GMM adds another equation to the difference GMM. Lagged levels are used to instrument the difference equation, while lagged differences are used to instrument the level equation. Bond et al. (2001) pointed out that difference GMM estimates are prone to the weak instruments problem, especially when dealing with tiny time series. As a result, for empirical analysis, the current study chose system GMM over difference GMM. It contains two estimation procedures: one-step and two-step.

In Monte Carlo simulation, it has been suggested that in small sample sizes, estimated asymptotic standard errors of an efficient two-step generalized method of moments (GMM) estimator are extremely vulnerable to downward biased problems, whereas one-step GMM estimators of asymptotic errors are unbiased and preferred. This is because one-step estimators employ weight matrices that are independent of estimated parameters, whereas the efficient two-step estimator uses a consistent estimate of the covariance matrix to weight the instruments (Windmeijer, 2005).

However, these ideal weighting matrices must be the inverse of an estimate, and the number of estimated elements in the matrix of estimators is quadratic in both the number of instruments and (T). More specifically, elements of the optimal matrix begin to serve as moments for the first vector of instruments, increasing the number of instruments and making estimation impossible for small sample size studies, while the researcher must reduce the number of instruments to make them valid and representative (Arellano & Bond, 1991; Roodman, 2009b). For sample sizes "N<100", one-step GMM estimates with robust standard errors are recommended (Arellano & Bond, 1991; Soto, 2009; Windmeijer, 2000). Similarly, because our sample size (17) is too small, we adopted a one-step approach to GMM estimation to account for all of the above concerns.

Results and Discussion

Result of Productivity Decomposition

As reported by McMillan and D. Rodrik (2011) and Fagerberg (2000), the economy can attain labor productivity growth in one of two ways. First, through the intra-sectoral (within) effect, which can result from factors such as the accumulation of human and physical capital or technological progress within a sector. Second, through the inter-sectoral (or structural change) effect, which occurs when labor moves from a low-productivity sector to a high-productivity sector.

Table 1 demonstrates the ability of SSA nations to benefit from this source of economic potential. From 1990 to 2018, average productivity levels increased by 58.6 percent each year. Of this, productivity growth within sectors accounted for 26.5 percent, with structural change accounting for 32.1 percent. Over the past 29 years, the structural change has been growth-enhancing. This is clear from the fact that the agricultural proportion of employment has declined from 70.4 percent to 51.5 percent, with the principal recipient being the service sector, which is nearly six times more productive than the agricultural sector for the whole period. We split the entire time into six sub-periods, which are grouped into historical development events. There were static gains and dynamic losses during the various development eras[2]. In other words, the static effect positively contributes 0.4481 percentage points. However, the dynamic effect contributes negatively, with -0.127 percentage points. This finding backs up the empirical findings of De Vries et al. (2015). While the service sector as a whole is more productive than agriculture, trade services, which have productivity levels considerably below industry sectors like transportation, business services, and financial services, are the main beneficiaries of the reallocation.

Determining structural change as growth-enhancing or growth-reducing depends on the structural balance, which is the sum of static gains and dynamic losses (Mensah et al., 2018). Throughout the different periods, structural change has been growth-enhancing in SSA (see Table 1). Even when productivity growth was negative (-14 percent) between 1990 and 1994, structural change contributed to 4 percent of productivity growth. When comparing productivity growth across development periods, the MDGs had a comparatively high rate of increase (2.9 percent). Even when comparing the productivity growth of the Post SAP and the MDGs over time, the productivity growth of the MDGs was consistently higher.

[2] De Vries et al. (2015) use the terms "static gains" and "dynamic losses" to describe the positive static effect and the negative dynamic effect.

Table 1

Decomposition of Labour Productivity Growth in SSA

	Period	Total	Within	Between (static)	Between (dynamic)	Structural change
All period	1990-2018	0.5864	0.2654	0.4481	-0.1270	0.3211
Post SAP	1990-1994	-0.1376	-0.1433	0.0160	-0.0103	0.0057
	1995-1999	0.0536	0.0454	0.0190	-0.0108	0.0082
MDGs	2000-2004	0.1474	0.1183	0.0295	-0.0003	0.0291
	2005-2009	0.2838	0.1993	0.0713	0.0132	0.0845
	2010-2014	0.1021	0.0100	0.1088	-0.0167	0.0921
SDGs	2015-2018	0.0196	-0.0013	0.0255	-0.0045	0.0209

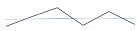
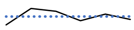
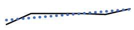
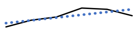
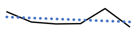
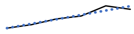
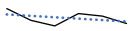
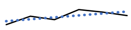
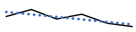
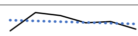
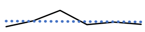
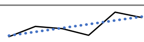
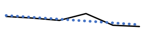
Source: Own computation from the GGDC Economic Transformation Database

Between 1990 and 2018, Table 2 shows the productivity growth of the sample countries in SSA. Compared to other countries, Uganda's productivity growth was the highest, at 50 percent. Within effect and structural change, both contributed 41 percent and 9 percent to this growth. Lesotho was the second country with substantial productivity growth, with a 44 percent increase in productivity from 1990 to 2018. This growth was fueled by 15 percent structural change and 27 percent within-effect growth. On the other hand, Cameroon and Kenya increased their productivity by 15 percent and 19 percent, respectively, and they were the last two countries in SSA. Even though their productivity was negative, the structural change was growth-enhancing, which is 8 percent for Cameron and 12 percent for Kenya.

Structural change has a growth-diminishing effect in some SSA countries, i.e., structural change has a negative contribution to productivity growth in Botswana, Ghana, Namibia, Nigeria, South Africa, and Zambia, which is -7, -0.3, -32, -14, -7, and -15 percent, respectively. All the same, in the majority of sample countries, structural change is growth-enhancing. Correspondingly, productivity growth trends in Lesotho, Mauritius, Mozambique, and Uganda declined over time, but structural change is still positive (Table 2).

Table 2

Decomposition of labour productivity growth in Sub-Sahara Africa (Country level, 1990-2018)

	Total	Within	Between (static)	Between (dynamic)	Structural change	Productivity growth trends
Botswana	0.0966	0.1759	-0.0184	-0.0610	-0.0794	
Burkina Faso	0.3184	0.2147	0.4949	-0.3912	0.1037	
Cameroon	-0.1522	-0.2365	0.2023	-0.1180	0.0843	
Ethiopia	-0.0146	-0.0943	0.0880	-0.0082	0.0797	
Ghana	0.3095	0.3128	0.0373	-0.0405	-0.0033	
Kenya	-0.1949	-0.3151	0.3931	-0.2728	0.1202	
Lesotho	0.4369	0.2862	0.1987	-0.0480	0.1507	
Malawi	0.1052	-0.0202	0.2701	-0.1446	0.1254	
Mauritius	0.3323	0.2404	0.1106	-0.0188	0.0919	
Mozambique	0.3586	0.2353	0.1131	0.0102	0.1233	
Namibia	0.3299	0.6519	0.3354	-0.6574	-0.3220	
Nigeria	-0.0388	0.0970	-0.0383	-0.0974	-0.1358	
Senegal	0.1291	0.0041	0.1963	-0.0714	0.1249	
South Africa	-0.0176	0.0544	0.0546	-0.1266	-0.0720	
Tanzania	0.2368	0.2103	0.1160	-0.0895	0.0265	
Uganda	0.5016	0.4083	0.0595	0.0338	0.0933	
Zambia	-0.0340	0.1197	-0.1219	-0.0319	-0.1538	

Source: Own computation from the GGDC Economic Transformation Database

Decomposition at the Sectoral Level

As shown in Table 3, labor productivity in SSA increased by 58.6 percent between 1990 and 2018, of which 26.5 percent resulted from the within-sector changes effect and the remaining 32.1 percent was attributable to the structural change component. The results in Tables 2 and

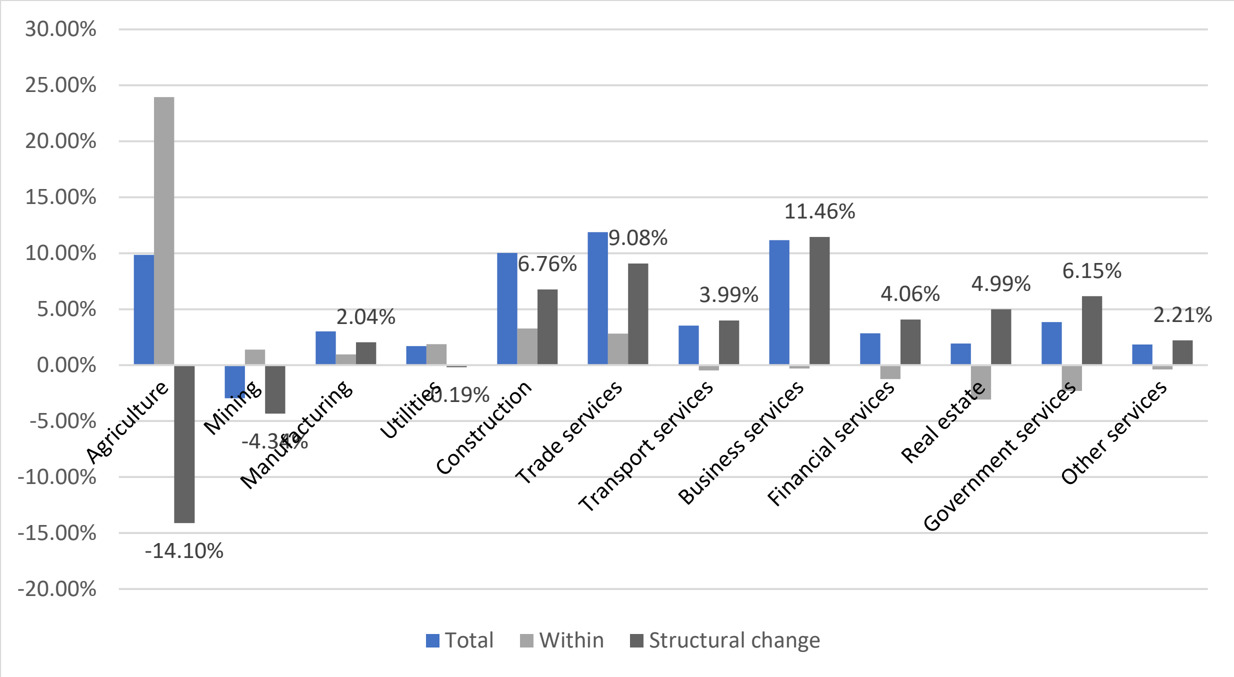
3 enable us to view the role of structural change on labor productivity growth in SSA across periods. Furthermore, achieving a positive structural change component for the entire economy suggests a movement in labor from low to high productivity sectors (Badriah et al., 2017; Fagerberg, 2000; McMillan et al., 2014). This means that labor in SSA has moved out of agriculture (indicated by the negative effect in Table 3 and Figure 1) and into higher productivity sectors such as business services, trade services, construction, and government services (indicated by the positive effect in Figure 1). Taking a look at Table further reveals that the business services, trade services, and construction sectors were the main drivers behind the growth-enhancing structural change, contributing to the growth of labor productivity by 11.5 percent, 9.1 percent, and 6.8 percent, respectively. However, although the structural component between 1990 and 2018 was positive for productivity growth, the analysis also saw a negative correlation between the relocation of labor and relative productivity. This implies a slowing in the productivity growth of the employment-growing sectors, with the exception of four of the twelve total sectors: manufacturing, construction, trade services, and business services, where both the labor share and relative productivity share are increasing over time.

Table 3

Sectoral decomposition of productivity growth (1990-2018)

	Total	Within	Between (static)	Between (dynamic)	Structural change
Agriculture	0.0985	0.2395	-0.0768	-0.0642	-0.1410
Mining	-0.0295	0.0139	-0.0377	-0.0058	-0.0434
Manufacturing	0.0301	0.0097	0.0189	0.0015	0.0204
Utilities	0.0169	0.0188	-0.0008	-0.0011	-0.0019
Construction	0.1004	0.0328	0.0346	0.0330	0.0676
Trade services	0.1188	0.0281	0.0751	0.0156	0.0908
Transport services	0.0352	-0.0047	0.0452	-0.0053	0.0399
Business services	0.1117	-0.0029	0.1232	-0.0086	0.1146
Financial services	0.0284	-0.0123	0.0687	-0.0281	0.0406
Real estate	0.0192	-0.0307	0.0937	-0.0438	0.0499
Government services	0.0385	-0.0231	0.0770	-0.0155	0.0615
Other services	0.0183	-0.0038	0.0268	-0.0046	0.0221
Total	0.5864	0.2654	0.4481	-0.1270	0.3211

Figure 1: Sectoral decomposition of productivity growth (1990-2018)



Source: Own computation from the GGDC Economic Transformation Database

Table 4

Correlation coefficient between employment share and relative productivity in a sector

Sectors	Correlation coefficient
Agriculture	-0.9402
Mining	-0.8876
Manufacturing	0.3140
Utilities	-0.5106
Construction	0.8939
Trade services	0.7959
Transport services	-0.3111
Business services	0.8198
Financial services	-0.2051
Real estate	-0.8488
Government services	-0.0032
Other services	-0.0591

Source: Own computation from the GGDC Economic Transformation Database

Empirical Result and Discussion for Determinant of Structural Change

Table 5 shows the association between our dependent variable, structural change (SC), and the regressors. Our dependent variable is divided into six time periods (1990–1994; 1995–1999; 2000–2004; 2005–2009; 2010–2014; and 2015–2018). Most of our regressors averaged over time except for AgrEMP. The result shows that the lag of the dependent variable, agricultural share in employment at the beginning of the period, domestic credit, mean years of schooling, trade openness, inflation rate, and growth rate of real GDP, which show a significant effect, and a variable population growth rate, which have no significant impact on structural change, The result is an empirical estimation based on a moment conditions estimator of Blundell and Bond's one-step system GMM, and interpretations for specific variables are given as follows:

The lagged dependent variable (the lags of SC) is significant at a 5% level of significance and has a positive coefficient. It implies that a better record of structural change in the past will improve structural change in the present. While structural transformation entails the modernization of the country's economy, society, and institutions, the economy transitions from rural to urban regions, and the degree of urbanization grows dramatically (Stern et al., 2006).

The initial share of employment in agriculture (AgrEMP) has a positive and statistically significant (with a 1% level of significance) impact on structural change. And this is the fact that a country's initial conditions of agricultural employment may influence the pace of structural change. For instance, given the large productivity gaps observed between agriculture and the remaining economic sectors, countries with a high share of employment in agriculture have (at least in principle) greater scope to benefit from employment reallocations. As these gaps close over time, the scope for reallocation gains is reduced (Martins, 2019).

Another variable that significantly affects structural change is domestic credit to the private sector (DC). This variable represents the level of financial development. In theory, more financial development might speed up structural transformation. Indeed, financial development encourages saving and capital reallocation to a critical mass of firms (Da Rin & Hellmann, 2002; Gui-Diby & Renard, 2015). All of this backs up our findings that show financial development positively impacts structural change.

Furthermore, trade openness plays a pivotal role in enhancing structural change in SSA. It affects structural change with a 1% significance level, and it is in line with several studies such as Frankel & Romer (1999; Irwin & Terviö, 2002; Teignier, 2018; Tsai & Huang, 2007). Trade openness makes it easier to obtain lower-cost or higher-quality intermediate items and updated technology, which boosts the economy's overall productivity. Because intense international competition allows for efficient transfer of price signals from the international market to the national economy, as well as increased dissemination of production and management knowledge and improved domestic efficiency, Consequently, undistorted price signals allow more efficient resource allocation following a country's comparative advantage, which in turn leads to more rapid economic growth (Agénor, 2004; Dollar & Kraay, 2004; Tsai & Huang, 2007).

The growth rate of real GDP also has an effect, as expected. It is significant at a five percent level and harnesses structural change through the demand side as incomes rise and production activities follow. However, structural change, as labor shifts from low-productivity to higher-productivity sectors, drives economic growth from the supply side (Nayyar, 2019).

We found a negative association between structural change and inflation. The intuition behind this is that high inflation is often related to more volatile inflation, and high and volatile inflation indicate a government's failure to maintain macroeconomic stability (Fisher, 1933). These factors raise uncertainty about asset value in the future, discouraging investment that relies on strong long-term returns to be profitable (Woodford, 2003). Such investment, especially when it incorporates new technologies, can be a significant source of productivity growth (Greenwood et al., 1997).

The last variable associated with structural change is the mean year of schooling (MYS), which is positively significant at the five percent level. Similar results were found by Karachiwalla and Palloni (2019). Their research on the relationship between educational attainment and structural change suggests that increased human capital leads to a long-term move away from agriculture. Also, according to Hoang et al. (2019) and Pelinescu et al. (2019), education is the most important means of investing in human capital. It directly affects the economy by increasing productive capacity and worker qualifications.

Table 5

The GMM Estimation results for the effects of structural change on productivity growth

Dependent variable	Structural change
Explanatory variables	coefficients and (standard errors)
Lage dependent variable (L.SC)	0.282**
	(0.132)
Agricultural share in employment at initial period (AgrEMP)	0.005***
	(0.001)
Domestic credit (DC)	0.001*
	(0.001)
Trade openness (TO)	0.001***
	(0.000)
GDP growth (GDPGr)	0.009**
	(0.004)
Inflation	-0.004***
	(0.001)
Mean year of schooling (MYS)	0.016**
	(0.007)
Life expectancy (LE)	0.001
	(0.001)
Constant	-0.517***
	(0.152)
Observations	85
Number of Country	17
AR(1)	0.004
AR(2)	0.118
Hansen	0.376
Number of Instruments	13.000

Note: *** p<0.01, ** p<0.05, * p<0.1 shows statistically significant at 1%, 5%, and 10% level respectively. Standard errors are in parentheses. P-values are reported for Arellano-Bond AR (2) and Hansen test statistics.

Empirical Result and Discussion for Effects of Structural Change on Productivity

The relationship between the dependent variable economy-wide Productivity growth (PG), our interest variable Structural change (SC), and other control variables is shown in Table 6.For six time periods (1990-1994, 1995-1999, 2000-2004, 2005-2009, 2010-2014, and 2015-2018), our dependent variable and interest variables are grounded.Thus, most of our regressors averaged over time except for AgrEMP[3]. The result shows that the lag of the dependent variable, structural change within effect, agricultural share in employment at the beginning of the period,

[3] The agricultural share of employment at the beginning of the period is computed using the GGDC 12-sector structural transformation database.

the growth rate of real GDP, mean years of schooling, inflation rate, and population growth, which show a significant effect, and a variable domestic credit to the private sector have no significant impact on productivity growth. The result is an empirical estimation based on a moment conditions estimator of Blundell and Bond's one-step system GMM, and interpretations for specific variables are given as follows:

The lagged dependent variable (the lags of PG) is significant at a 5% significance level and has a positive coefficient. It implies that a better previous record of productivity will improve productivity in the current time. It is as expected since productivity involves the modernization of a country's economy, society, and institutions. The country's economy shifts from rural areas to cities, and the degree of urbanization significantly increases (Stern et al., 2006).

The estimation result shows that our key variable, structural change is overwhelmingly favorable with five percent significant level. This means that structural change has the ability to promote growth. This finding backs up the hypotheses of Lewis (1954), Kuznets (1957), (Kaldor, 1961), and (Chenery, 1960). Many empirical investigations, notably in the case of Asian nations, such as Vu (2017), and McMillan et al. (2017), support this result. Also, in the context of Organization for Economic Cooperation and Development (OECD) countries, Silva and Teixeira (2011) and Teixeira and (A. A. Teixeira & A. S. Queirós, 2016) revealed a strong positive impact of structural change on productivity growth.

The majority of the chosen control variables show their expected theoretical and empirical indications and importance. The result shows the within effect is strongly significant for overall productivity growth. As mentioned in the descriptive analysis part, the components of the within effect are factors such as the accumulation of human and physical capital or technological progress within a sector (Fagerberg, 2000; M. S. McMillan & D. Rodrik, 2011). This result is in line with our descriptive analysis.

The result shows that government effectiveness positively affects productivity growth, which is significant at a ten percent level of significance. A related study conducted by Bedane et al. (2017) indicates that governance is a major determining factor in the allocation of foreign aid by many multilateral development banks, including the World Bank and the Asian Development Bank, as well as many countries, including the United States.

Table 6

The GMM estimation results for the analysis of the determinants of structural change

Dependent variable Explanatory variables	Productivity growth coefficients and (standard errors)
Lag dependent variable (L.PG)	0.321**
	(0.120)
Structural change (SC)	0.114***
	(0.038)
Within productivity effect (WE)	0.682***
	(0.091)
Population size (lnPoP)	0.002
	(0.008)
Government size (Govsize)	-0.002
	(0.002)
Government effectiveness (Goveffectiveness)	0.041*
	(0.021)
Constant	0.030
	(0.160)
Observations	85
Number of Country	17
AR(1)	0.001
AR(2)	0.542
Hansen	0.281
Number of Instruments	12.000

Note: *** p<0.01, ** p<0.05, * p<0.1 shows statistically significant at 1%, 5%, and 10% level respectively. Standard errors are in parentheses. P-values are reported for Arellano-Bond AR (2), and Hansen test statistics.

Conclusions and Implications

The paper uses a shift-share methodology to analyze the impact of structural change on labor productivity development in SSA countries between 1990 and 2018. The study's findings indicate the existence of growth-promoting structural change in the SSA area, indicating that structural change has a beneficial impact on overall productivity growth. 11 of the 17 nations in the sub-region have benefited from growth-enhancing structural transformation. Between 1990 and 2018, the proportion of agricultural employment in SSA nations decreased, while employment in services increased at the fastest rate. Because agriculture has the lowest labor productivity, reallocating people from agriculture to other sectors resulted in a positive structural adjustment, boosting aggregate productivity and economic development. Although structural change was the primary driver of productivity growth over the research period, within-sector productivity improvements played a significant and frequently expanding role. Services were the dominant engine of economic growth and the leading catalyst for structural change in terms of sectoral dynamics. Agriculture and industry were not supportive of structural change since they released labor to higher-productivity sectors (at least in relative terms). The research also reveals a negative relationship between labor reallocation and relative productivity growth, indicating a decrease in the productivity growth of employment in expanding industries. This might also indicate the modern economy's inability to absorb agricultural labor surpluses.

In addition, we conduct empirical analysis to investigate the determinants of structural change. We found that a country's initial conditions of agricultural employment positively influence the pace of structural change. A positive relationship between access to domestic credit in the private sector and structural change indicates that the role of financial development in driving structural change is important. A positive effect of trade openness on structural change is also discovered in our analysis, implying that trade policies are critical in supporting the reallocation of labor from low- to high-productivity sectors. Similarly, the result shows GDP growth has a positive effect on structural change. The analysis also reveals the negative effect of inflation on structural change. The positive effect of a mean year of schooling on structural change reveals that an increase in human capital leads to a move from low-productivity to high-productivity sectors.

Finally, the study also estimates the effect of structural change on productivity growth using the Generalized Methods of Moments (GMM) technique. The result confirmed the shift-share analysis that structural change is an important booster of productivity growth in SSA countries. The estimation result shows that structural change is overwhelmingly favorable with a high significance level, and this reveals that structural change can promote growth in the SSA region. The study's findings suggest some key policy recommendations. Policymakers in Africa and other emerging areas such as Asia and Latin America may need to devise policies to promote structural change. Industrialization and tertiarization might be a very smart approach, as no country in the world has achieved development based on agriculture except Australia, New Zealand, and Canada (Opoku & Yan, 2018).

Manufacturing's percentage of total employment and productivity in the region is decreasing. If an industry has the capacity to absorb extra workers, legislation that focuses on its expansion is urgently needed. However, this would be insufficient; labor would need to be retrained to become employable to reverse the trend of workers shifting to less productive sectors. Mining, which has a high productivity level, might be targeted for expanded labor employment, even though it will likely remain capital-intensive. We also propose a new policy that focuses on trade services and manufacturing, which tend to absorb a significant portion of the agricultural sector. Productivity and development may improve if measures are taken to improve this sector's access to financing, machinery, and equipment. Finally, if the data permits, the analysis can be enhanced by including more disaggregated economic sectors. Comparing other areas of the world, such as Asia, Latin America, and OECD countries, is also possible.

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