THE EFFECT OF STRUCTURAL TRANSFORMATION ON SOCIO-ECONOMIC DEVELOPMENT IN SUB-SAHARAN AFRICA.

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Abstract
Theoretically, structural transformation is important for growth and economic development. Empirical evidence, however, shows that the effect of the structural allocation pattern on growth differs across developing and developed countries. The present study seeks to analyze the effect of structural transformation on socio-economic development in Sub-Saharan Africa. The study adopted the theoretical foundations of the theory of dualism and a productivity decomposition method to specify the model for the effect of structural allocation on socio-economic development. From the decomposition result, the study found that between effects for industrial and services sector contributes positively on the average to productivity in the region, even though the total economy had an overall negative productivity. Furthermore, using the fixed and random effects regression method of estimation for a panel data of 36 Sub-Saharan African countries, the analysis of the study shows that structural transformation effects on socioeconomic development is attributed to only the agricultural sector out of the three sectors included in the model. The industrial and services sector within and between effects do not have any effect on socioeconomic development even though they contribute to economic productivity growth via the between effect.

Keywords: Structural transformation, labour reallocation, socio-economic development, productivity

1 Introduction

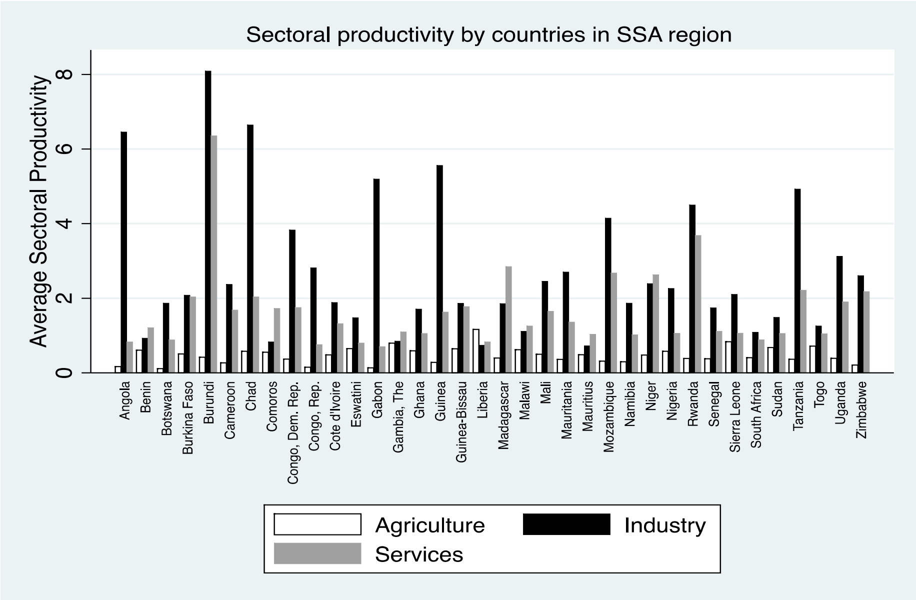
Structural transformation is important for efficient allocation of resources for more productive use. As defined in the work of Lewis (1954) and Kuznets (1966), the transformation involves the reallocation of productive resources from the agricultural sector to the modern sectors leading to increase in productivity and income. Structural transformation is therefore important for growth but the changing process or reallocation process in developing countries may differ from that of the developed countries. In developed economies, structural transformation is associated with advancement in socio-economic development while the developing economies are still experiencing productivity gaps with few isolated productive sectors (UNCTAD, 2016). Such productivity gaps may hinder the sustainability of economic growth that is necessary for socio-economic development.

While it is expected that the productivity across sectors would converge with economic growth, this may not necessarily be the case or may not lead to economic wellbeing as seen with the developing countries. According to Sarma, Paul and Wan (2017), structural transformation-led growth may necessarily not lead to improvement of the welfare of the poor or decrease inequality. This is because the poor may find it difficult to adjust to the transformation process and may in turn widen the inequality gap. Sub-Saharan Africa (SSA) countries may particularly be faced with the challenges of adjustment because of the prevailing socio-economic issues in the region. High incidence of poverty, inequality and unemployment are major factors that can be worsened if the process of transformation is not pro-poor. Although, it may be inefficient or impossible to try to stop the structural transformation process, it is very important to reduce the redistribution consequences on the poor (Timmer & Akkus, 2008). It is therefore required that structural transformation is supported with policies that would drive the process towards a sustainable and inclusive development.

Available data for SSA reveals that higher resources may necessarily not lead to increased productivity.

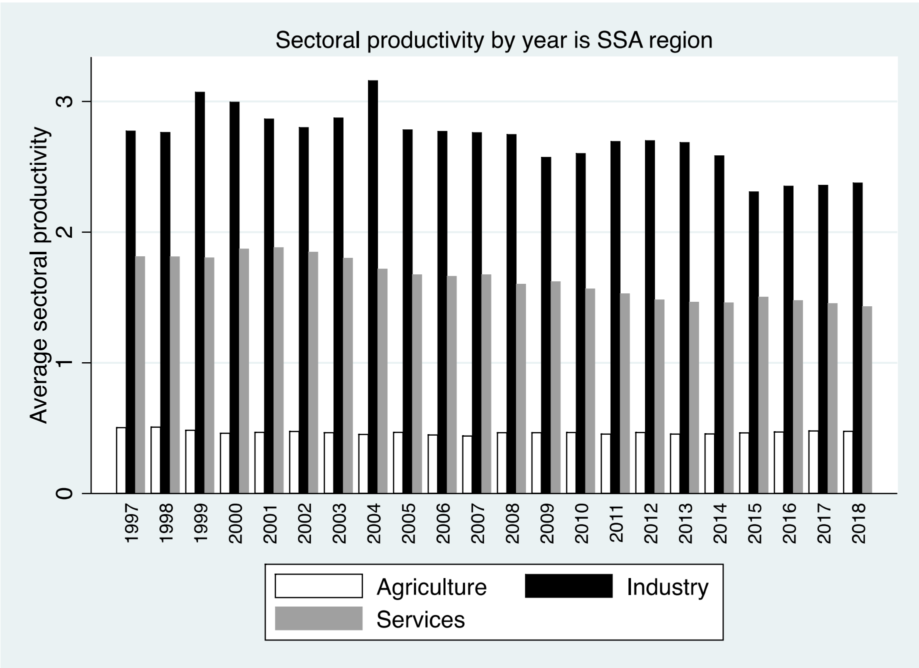
Despite the slow decline in the yearly average agricultural employment in the region (see Figure 3), the sector remains the largest employer of labour, employing an average of 52.97% of total employment between 1997 to 2018. This percentage is not commensurate with the level of productivity in the sector with an average relative productivity of 0.47 over the same period. As seen in Figure 1, the agriculture productivity remains lower than that of the other sectors for most countries. The structural transformation would require that labour would move to a more productive sector, which is not the case here. As noted in Badiane, Ulimwengu, & Badibang (2012), the existing gap between agricultural productivity and employment is a reflection of the major challenge for African economies.

Figure 1: Sectoral productivity by countries in the SSA region



Source: Author’s computation using WDI data

Figure 2: Sectoral value added by years in SSA

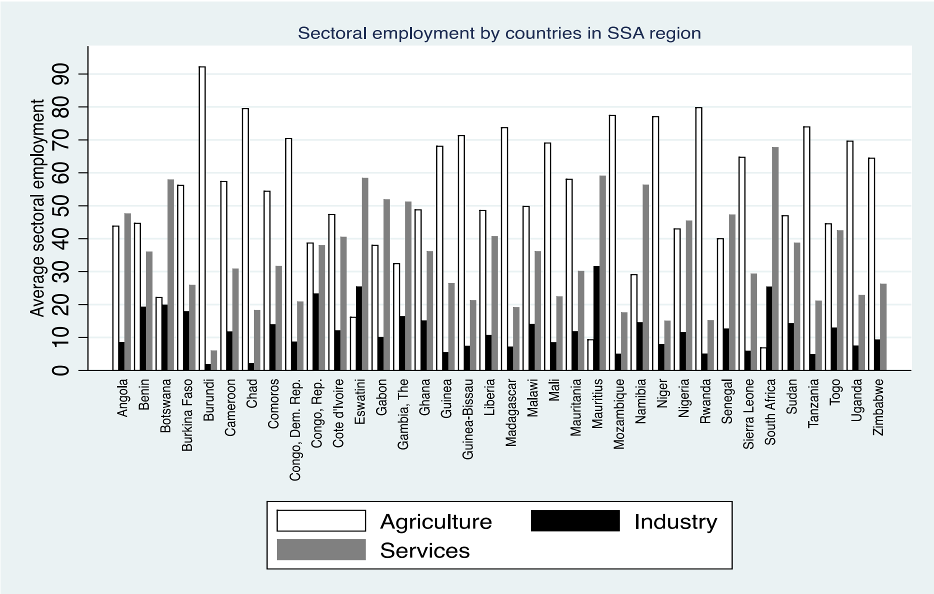


Source: Author’s computation using WDI data

In contrast to this is the industrial sector, which has the lowest average of 12% share of employment and with a relative higher productivity of 2.71. From Figure 2, it can be seen that the industrial sector relative productivity is the highest of the three sectors and has increased steadily over the period indicated.

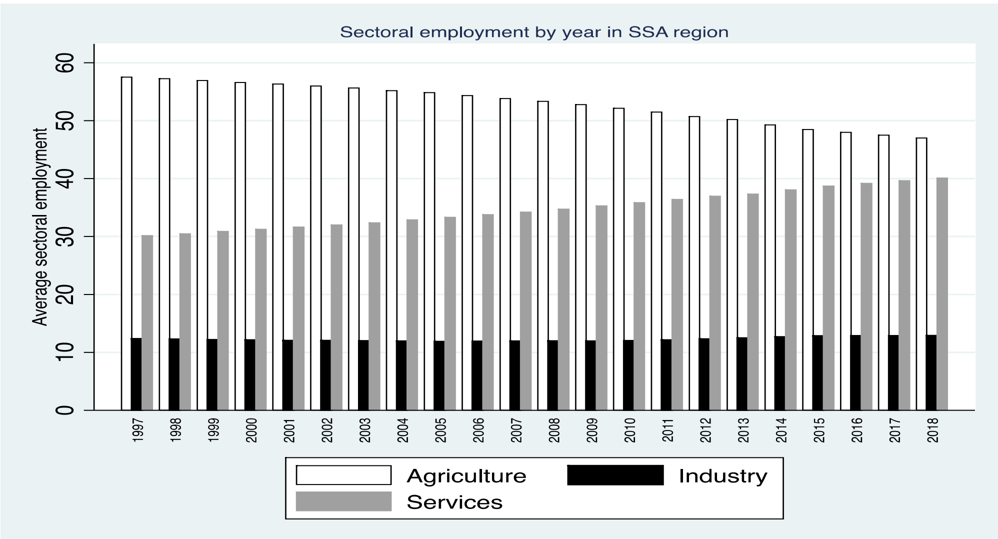
As indicated in Figure 3, industrial average employment for most of the countries is relatively low. Also in Figure 4, the yearly average of industrial employments is relatively constant over the period of this study indicating that there is low employment in he sector despite its high productivity. The services sector witnessed a steady rise in employment with an average 35% between 1997 and 2018 as shown in Figure 4 and average relative productivity of 1.64, which is higher than that of the agricultural sector but lower than that of industry.

Figure 3: Sectoral employment by countries in SSA region



Source: Author's computation using WDI data

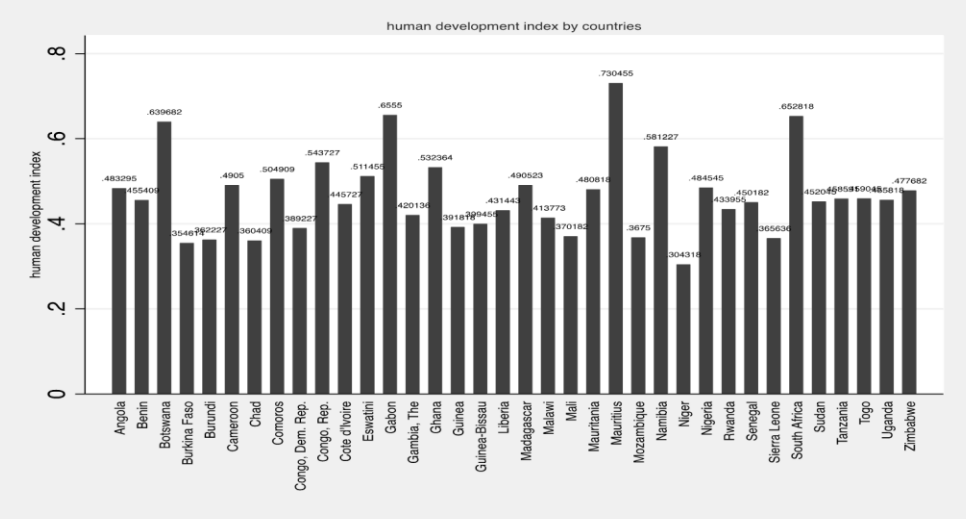
Figure 4: Sectorial employment by year in the SSA region



Source: Author's computation using WDI data

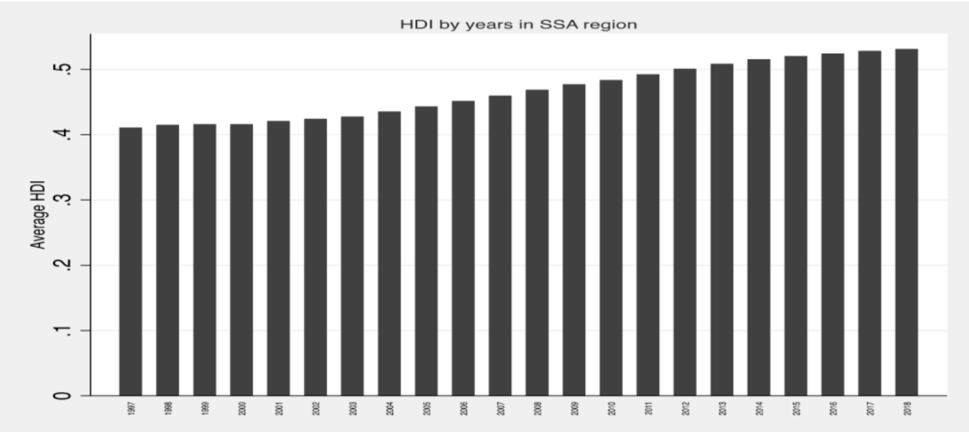
From the graphs, it can be seen that for the period studied, the likely transformation appears to have been that of the movement of labour from agriculture to services. Given the constant low average employment share of the industrial sector over the years, labour reallocation has not been towards the industrial sector.

Figure 5: HDI by countries in the SSA region



Source: Author's computation using WDI data

Figure 6:HDI by years in the SSA region



Source: Author's computation using WDI data

HDI, on the other hand, has a low average value of 0.47, indicating a barely medium level of HDI (compared to the lower tier income classification) for the countries in the region. Although, from Figure 6, it can be seen that even with the low regional average, the yearly average indicates that there has been a very slow improvement in the HDI over the years.

Given the trend in transformation and the socio-economic development indicator, it is important to understand how these two relate to improving the effectiveness of the social policies in the region for a more needed equitable and inclusive development. According to Bah (2011), developed countries may follow similar process of structural transformation but the developing countries are faced with structural heterogeneity which may necessarily not be associated with development as originally posited by the theory of transformation. This productivity gap in the transformation process necessitates the need to investigate if structural transformation translates into socio-economic development in the SSA region. More specifically, the study seeks to understand the aspects of the structural decomposition that is crucial for the socio-economic development in the region. Thus, the objective of the paper is to analyze the effect of structural transformation on socio-economic development in the Sub-Saharan Africa region.

The rest of this paper is structured as follows: Section 2 provides the literature review and Section 3 presents the methodology and a description of the data used in the study. The analysis and discussions of results are undertaken in Section 4 while Section 5 concludes the paper.

2 Literature review

The theory of the role of structural change in development can be traced to the works of Kuznet (1966) and Lewis (1954) which was further quantified by the work of Chenery (1960). These studies explain how the movement of economic resources from the traditional to modern sector forms the basis of economic growth and development. The coexistence of modern economic activities with high productivity and traditional informal economic activities in developing economy, as illustrated in works of Lewis (1954) and Ranis & Fei, (1961), implies that developing economies are characterized by structural heterogeneity. Economic growth is then driven by how efficient the labour moving from the traditional sector is being absorbed in the modern sector. However empirical evidence shows that these theories were able to explain developed countries situations better than those of the developing countries (Bah, 2011).

The empirical literature on how structural transformation affects growth and development can be categorized into those explaining how the structural allocation patterns drive growth and development and those explaining how structural transformation affects specific socio-economic issues like poverty, inequality and employment. Some of the studies explaining the labour allocation patterns of structural transformations and how they drive economic growth across developing countries include de Vries et al. (2012), de Vries, Timmer and de Vries (2015) and McMillan, Rodrik and Verduco-Gallo (2014) while those that tried to explain how the transformation affects specific social-economic issue like poverty and inequality include Badiane et al. (2012); Cheong & Wu (2014); Sarma et al. (2017).

de Vries et al. (2012) studied the implication of structural transformation on productivity growth in BRIC (Brazil, Russia, India and China) countries using the structural decomposition method to measure the contributions of structural change to growth. The findings suggest that structural transformation is contributing to the growth of China, Russia and India while it is not the case for Brazil.

Badiane et al. (2012) studied the implication of structural transformation on income growth and poverty reduction in African countries for the period of 1960 to 2008. Using graphical trend analysis, the study found that the pace and pattern of structural transformation is productivity reducing as a result of labour reallocation from underperforming agricultural sector to a low productivity service sector.

Cheong & Wu (2014) examined the effect of structural upgrading on industrial upgrading and inequality in China. The study adopted the GIni coefficient measure of inequality by region and decomposed the economy by strata of industries. It was found that structural transformation improved the general standard of living and boosted the economic growth of China. However, the uneven process of industrialization worsen inequality in the region.

McMillan et al. (2014) analysed the productivity differentials within and across sectors with the aim of understanding how structural transformation drives economic growth. Using data covering 38 countries (29 developing and 9 developed countries), the study found that reallocation of labour was growth inducing in the 1990s for both Africa and Latin America. The result also found out that structural transformation contributed to growth of Africa in 2000. The study suggests that there is a huge growth potential for African economies through structural transformation if the policy makers are able to support the transformation process.

To understand the effect of structural transformation on productivity growth in developing countries, de Vries et al. (2015) analysed the effect of structural transformation on productivity growth in 11 Sub-Saharan African countries using a productivity decomposition method. The paper focused on how the movement of labour across different sectors affects aggregate productivity growth for the period of 1960 to 2010. The study found that there was high reallocation of labour to the manufacturing sector in the 1970s thereby leading to high productivity. Structural transformation stalled between 1975-1990 leading to slower growth in productivity but picked up afterwards when labour moved towards the services sector, thereby increasing productivity growth. Overall, the study suggests that static effects or structural allocation effect is associated with productivity growth if labour move from a lesser productivity to a higher productivity sector.

Also, Sarma et al. (2017) examined the effect of structural transformation on income growth and inequality in Vietnam. The study used the Recentered

Influence Regression to analyse the gains of structural transformation on income and decomposition analysis to map out the effect of structural transformation on income inequality. It was found that structural transformation leads to sustained growth but the growth exhibits pro rich gains, thereby increasing inequality.

The common findings for studies explaining the effects of the structural transformation patterns are that the patterns are heterogeneous across different continents and sometimes across different countries and so are their effects on growth. For example, de Vries et al. (2015) found that structural transformation improves the growth of three of the BRIC countries i.e. India, Russia and China while it is growth reducing for Brazil. Similar to this is the work of McMillan et al. (2014), which found that structural transformation contributed to growth in Africa in some periods while it was growth reducing in some other periods. Bah (2011) found that the pattern of structural transformation differs for developing and developed countries. While there are gains for developed countries, structural transformation occurs without growth for some periods in developing countries.

The review of past studies shows that empirical evidence focused on explaining how structural transformation drives growth by studying its patterns across different sectors. Also, the previous studies explaining how structural transformation affects socio-economic development studied its effects on specific problems like poverty and inequality. To the best of the author's knowledge, none of the past studies has been able to establish a link between the transformation patterns and socioeconomic development as a composite index. Hence, the present study tries to fill this gap by analysing the effect of the structural transformation patterns on socio-economic development, using the HDI as a composite index measure for socio-economic development.

3 Methodology and Data

The study is based on the theoretical foundations of Lewis (1954) and Kuznets (1966), which posit that the movement of labour and other resources from the traditional agricultural sector to the modern sector will increase productivity, which will in turn lead to social and economic development. This idea can be translated into the model given as follows:

$$HDI = f(\Delta Y, M) \quad (1)$$

where *HDI* is Human Development Index which is a proxy for a composite index of the social development, ΔY is the change in the aggregate economic productivity, which is required for economic development and M is a vector of other macroeconomic factors that determine economic development.

To capture the dynamism of structural changes, the study follows the models of de varies et al. (2015) and McMillan, Rodrik and Sepulveda (2016) which originated from Fabricant (1942). The model decomposes the changes in aggregate productivity into the changes in productivity across sectors and the movement of employment between sectors. Starting with the equation of aggregate productivity given below.

$$Y = \sum_{i=1} y_{it} S_{it} \quad (2)$$

thus, (t = 1,2, …T; i = 1,2, … n)

The change in aggregate productivity can be further decomposed as specified below.

$$\Delta Y = \sum_{i=1} \Delta y_{it} S_{it} + \sum_{i=1} \Delta S_{it} y_{it} \quad (3)$$

similarly, (t = 1,2, …T; i = 1,2, … n)

where y_i represents productivity for each sector i, S_i is the employment in each sector i, Δ represent the change in the variables, *t* is time. The change in the aggregate productivity is decomposed into two changes, that is, the within-sector productivity changes $(\sum_{i=1} \Delta y_{it} S_{it})$ and the change in the sectoral allocation of labour also known as structural change $(\sum_{i=1} \Delta S_{it} y_{it})$, The within-sector productivity change or productivity effect, which is the first term on the right side of Equation 3, measures the changes in sectoral productivity weighted by the sectoral employment. That is, it measures how productivity changes with sectoral labour allocation. The second term represents the between effect

(reallocation or structural change effect), which captures the productivity effects of labour movement across sectors or measures the contributions of labour allocations across sectors.
Equation 3 can be used to decompose the aggregate productivity. Table 1 gives a summary of the within, between, dynamic effects and the total growth of 36 Sub-Saharan African countries (unweighted average) between 1997 and 2018.

Table 1 Decomposition results in Sub-Saharan Africa between 1997 and 2018

Sector	Value added	Employment	Sectoral Productivity	Within	Between	Total Sector
Agriculture	24.55	52.97	0.46	-0.11	-0.25	-0.36
Industry	24.66	12.25	2.01	-0.16	0.10	-0.05
Services	44.72	34.78	1.29	-0.48	0.71	0.23
Total Economy	93.94	100.00	3.76	-0.74	0.56	-0.19

Source: Author's computation 2021

Notes: The result is based on the unweighted average of 36 countries in Sub-Sahara Africa between 1997-2018. The sectoral value added (in percentages) does not add up to 100% for some of the countries making the total average to be a bit less than 100%. The within and between effects are estimated using the decomposition method in McMillan, Rodrik and Sepulveda (2016) as specified in Equation (3), for each country, and the unweighted average for the 36 countries is given on the table. Sectoral productivity is estimated as the value added divided by the employment of each sector and it is given as a ratio of the total economy.

The figures presented on the Table 1 are the unweighted averages of the variable across a panel of 36 Sub-Sahara African countries. From Table 1, the negative within effect implies that sectoral productivity is slow and its growth is negative in the region for the period studied. Conversely, the between effect is positive for the industrial and services sectors, implying that there is labour reallocation gains in those two sectors. This means that labour force coming from other sectors is productive in these sectors. Overall, the region only experienced a sectoral productivity growth in the services sector and negative productivity growth for the whole economy.

In continuation of the model specification, we can express the M vector in Equation 1 as consisting of investment ratio of GDP (INV) as a proxy for capital, government expenditures (GOV) and trade openness (TO). This is expressed as follows.

$$M = f(INV, GOV, TO) \quad (4)$$

Theoretically, as posited in growth theories, it is expected that investment in capital stock would improve productivity and, hence, economic growth and development. Similarly, government expenditure in infrastructures and social amenities should (in the absence of much corruption and other wastes in government spending) improve economic growth and development (Dao, 2012). Lastly, trade openness enables the transfer of knowledge and technical knowhow that increases efficiency and productivity, which in turn improves social economic development. According to Pernia & Quising (2005), trade openness creates opportunities that would improve socio-economic development through poverty reduction.
Given that the sectors included are agriculture, industry and services, inserting Equations 3 and 4 into 1 and expressing the result in econometric format (by including the error terms μ and ε), we arrive at the equation below:

$$HDI = \beta_0 \Delta Agric_{jt} * AgricEmp_{jt} + \beta_1 \Delta Ind_{jt} * IndEmp_{jt} + \beta_2 \Delta Serv_{jt} * ServEmp_{jt} + \beta_3 \Delta AgricEmp_{jt} * Agric_{jt} + \beta_4 \Delta IndEmp_{jt} * Ind_{jt} + \beta_5 \Delta ServEmp_{jt} * Serv_{jt} + \beta_6 inv_{jt} + \beta_7 gov_{jt} + \beta_8 to_{jt} + \mu + \varepsilon \quad (5)$$

where
HDI = Human Development Index,

Agric = Agricultural productivity i.e. agricultural value added divided by agricultural employment
AgricEmp = Percentage of agricultural sector employment in total employment *Ind* = industrial productivity i.e. Industrial value added divided by industrial employment
IndEmp = Percentage of industrial sector employment in total employment, *Serv* = Services productivity i.e. services value added divided by services employment
ServEmp = Percentage of services employment in total employment
inv = Investment share of GDP
gov = Government expenditure share of GDP
to = Trade openness *j* is the country dimension and *t* is the time dimension. μ and ε are the country fixed effect and the error term respectively. $\beta_v, (v = 0, 1, \dots 8)$ represents the coefficients of the variables.

For brevity, we summarize Equation 4 as follows:

$$HDI = \beta_0 Agricwit_{it} + \beta_1 Indwit_{it} + \beta_2 Servwit_{it} + \beta_3 Agricbtw_{it} + \beta_4 Inbtw_{it} + \beta_5 Servbtw_{it} + \beta_6 inv_{it} + \beta_7 gov_{it} + \beta_8 to + \mu + \varepsilon \quad (6)$$

Where
Agricwit (agricultural within effect) = Change in agricultural productivity weighted by agricultural employment.
Indwit (Industrial within effect) = Change industrial productivity weighted by the industrial employment.
Servwit (service within effect) = Change in service productivity weighted by service employment
Agricbtw (agricultural between effect) is the change in agricultural employment multiplied by agricultural productivity
Indbtw (industrial between effect) = Change in industrial employment multiplied by industrial productivity *Servbtw* (service between effect) = Change in service employment multiplied by the service output *inv*, *gov* and *to* remain as defined in Equation (5)

The a priori expectation is a positive relationship for all the coefficients except the between effect, meaning that an increase in any of the variables would lead to an increase in *HDI*. Since the within and between effects are decompositions of the aggregate productivity, It is expected that the within effects would have a positive effect on HDI while the between effect will have either a positive a negative effect on HDI. This is because it is expected that an increase in the within sector productivity would increase aggregate productivity and hence have a positive effect on the HDI. However, the between effect is largely dependent on the structural or reallocation pattern of labour and may or may not increase productivity. Finally, *inv*, *gov* and *to* are expected to have positive effects on HDI as explained earlier in Equation (4).
The model is estimated using the panel fixed and random effect regression method. Descriptive and correlation analysis are given to examine the nature of the data and the strength of the relationship between the variables respectively. Robustness and diagnostic tests such as heteroscedaticity, multicollinearity, randomness, poolability and autocorrelation tests are carried out to ensure the reliability of the results.
The study covers the period of 1997-2018 for 36 countries in the SSA region. The countries were selected based on data availability and because of the similarity in the socio-economic issues of the region.
The HDI data was sourced from the UNDP database. HDI is a composite index of life expectancy, literacy and per-capita income indicators, which is used to rank countries across the world. A high HDI score for a country would mean that the country have a high life expectancy, literacy and income per person.
The available HDI data on the database is from 1999 so the previous years were collected from the HDI yearly reports for 1997 and 1998. Data for agricultural, industrial and service productivity, agricultural, industrial and service employment, investment, government expenditures and trade openness were all sourced from the World Bank's World Development Index (WDI) online database.

4 Results Analysis and Discussion

Table 1 presents the result of the summary statistics. The table consists of the columns for the variables and their description, the total number of observations (obs), mean, standard deviation (Std.Dev.), coefficient of variation (Coef. Of var), the minimum (Min) and the maximum (Max) values. The total number of observations for all the variables included is 792.

Table 2: Summary Statistics

Variable	Description	Obs	Mean	Std. Dev.	Coef of var	Min	Max
HDI	Human Capital Development (in %)	792	46.67	10.37	0.22	24	79.6
Agric	Agricultural productivity (ratio of total productivity)	792	0.47	0.23	0.50	0.08	1.56
Agricemp	Agricultural employment (% of total employment)	792	52.97	21.18	0.40	4.60	92.30
Ind	Industry productivity (ratio of total productivity)	792	2.71	2.04	0.75	2.04	20.47
Indemp	Industrial employment (% of total employment)	792	12.25	7.07	0.58	1.51	39.25
Serv	Service productivity (ratio of total productivity)	792	1.64	1.12	0.69	0.39	7.74
Servemp	Service employment (% of total employment)	792	34.78	15.44	0.44	5.49	71.93
Inv	Investment (% of GDP)	792	20.95	8.61	0.41	-2.42	60.16
Gov	Government expenditure (% of GDP)	792	13.77	5.14	0.37	0.91	30.07
To	Trade openness (% of GDP)	792	68.35	34.07	0.50	17.86	311.35

Source: Author's computation (2021)

The mean value of 0.47 for the region indicates that the HDI value is lower than the 0.55 lower income tier categorization of HDI. The industrial productivity has the highest mean value of 2.71 compared to the other sectors, indicating that productivity in the sector is relatively higher than that of agriculture and industrial ectors with values of 0.47 and 1.64 respectively. Conversely, agricultural employment has the largest average of the three sectors with the value of 52.97 while industry and service sectors have 12.25 and 34.78 percentages of total employment respectively. This means that on the average the largest employer of labour is the agricultural sector.

The standard deviation shows how the values of the variables deviate from their mean values. As this may not be comparable across the variables, the coefficient of variation is included for comparison purpose. The value of the coefficient of variation is comparatively the highest for the industrial productivity. The maximum values for the sectoral productivities compare to their averages indicate that we have some countries having higher productivities in these sectors despite the low average. Similarly, the maximum value of the sectoral employment indicates that some countries have more people employed in these sectors despite the lower average reported for the region. The maximum industrial employment share of 34% is however comparatively lower than that agricultural sector (92%) and services sector (72%), indicating a lower level of employment in the sector. Coming to the correlation analysis, the pairwise correlation coefficients with their p-values are presented in Table 2. The estimation shows the existence (or lack of it) and direction of the relationship between the variables. Based on popular practice in statistic and econometric analysis, a p-value of less than 5% is taken in this study to indicate that the value of the coefficient is significant and the null hypothesis of no correlation will be rejected.

Table 3: Correlation Matrix

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)	hdi	1.000									
(2)	agricwit	0.034	1.000								
		(0.349)									
(3)	indwit	-0.016	-0.363	1.000							
		(0.657)	(0.000)*		[1]						
(4)	servwit	0.036	-0.362	-0.410	1.000						
		(0.326)	(0.000)*	(0.000)*							
(5)	agricbtw	0.074	-0.169	0.121	0.232	1.000					
		(0.042)*	(0.000)*	(0.001)*	(0.000)*						
(6)	indbtw	-0.126	0.032	-0.114	-0.181	-0.593	1.000				
		(0.001)*	(0.388)	(0.002)*	(0.000)*	(0.000)*					
(7)	servbtw	-0.088	0.078	-0.112	-0.294	-0.608	0.515	1.000			
		(0.016)*	(0.031)*	(0.002)*	(0.000)*	(0.000)*	(0.000)*				
(8)	inv	0.240	-0.002	-0.071	0.019	-0.029	0.164	0.021	1.000		
		(0.000)*	(0.956)	(0.052)	(0.602)	(0.425)	(0.000)*	(0.564)			
(9)	gov	0.226	0.006	-0.058	0.053	0.116	-0.046	-0.026	0.104	1.000	
		(0.000)*	(0.874)	(0.110)	(0.143)	(0.001)*	(0.204)	(0.482)	(0.003)*		
(10)	to	0.356	0.014	0.017	0.056	0.024	-0.119	-0.180	0.290	0.263	1.000
		(0.000)*	(0.705)	(0.639)	(0.123)	(0.518)	(0.001)*	(0.000)*	(0.000)*	(0.000)*	

Source: Author's computation (2021).

[1]

Explanatory Notes: The following are the meaning of the acronyms on the table; HDI is the Human Capital Index, Agricwit is the change in agricultural productivity weighted by agricultural employment, Indpe is the change industrial productivity weighted by industrial employment, Servpe is services productivity weighted by services employment, Agricwit is the change in agricultural employment multiplied by agricultural productivity, Indbtw is the change in industrial employment multiplied by industrial productivity, Servbtw is the change in service employment multiplied by services productivity, inv is investment as percentage of GDP, gov is government expenditures as a percentage of GDP and to is trade openness as a percentage of GDP . The coefficient of correlation is the upper values, followed by the p-

From Table 2, the coefficient of *hdi* has a statistically significant positive correlation coefficient with *agricbtw*, *inv*, *gov* and *to*, meaning that *hdi* and those variables are moving in the same direction. Similarly, *hdi* has a statistically significant negative correlation coefficient with *indbtw* and *servbtw*, indicating that *hdi* and those variables are moving in opposite directions. All other variables in the subsequent column have low values of the correlation coefficients indicating that there are no likely threat of multicolinearity in the model. As a confirmatory check the study also conducts the Variance Inflation Factor (VIF) to test for multicollinearity in the model.

The regression results are presented in Table 3. For each of the 4 regressions reported, the study carried out diagnostic tests to ensure the appropriateness and validity of the models estimated. The test carried out includes the following: poolability test for the

appropriateness of OLS regression over fixed effect model, the Hausman test for the appropriateness of random effect over fixed effect model, the cross-sectional dependent tests, heteroscedasticity test, serial correlation test and the VIF test for multicollinearity. All the diagnostic test results are given in the appendix. Starting from the poolability test, the F statistics of the fixed effect regression are significant for all the models and this indicates that the fixed effect regression is superior to the OLS regression. The outcomes of the Hausman test indicate the appropriateness of the fixed effect regression over the random effect regression. All the tests were significant at less than 1%, so we reject the null hypothesis that the random effect regression is efficient. There exists no cross-sectional dependence in the models as indicated in the result of the Paseran cross-sectional dependence (CD) test. The heteroscedasticity tests also indicated the presence of heteroscedasticity in the models since the χ^2 test statistics were significant at less than 1%. To correct for the presence of heteroscedasticity and autocorrelation, a heteroscedatic and autocorrelation consistent standard error is adopted for the analysis. The Wooldridge test for serial correlation shows that first-order autocorrelation is present in the models as indicated by the significant p-values that are less than 1%, this problem would as well be catered for, with the use of HAC standard error. Finally the VIF test for multicollinearity indicated a mean VIF of 1.88 when all the variables are included in the model. It is also observed that non of the individual variable is having a VIF value of up to 6 benchmark, indicating that there are only moderate multicollinearity among the variables and there would be no serious threat to the validity of the test statistics.

Moving to Table 3, the table is divided into 3 main columns reporting the regression outputs, which includes a combination of the different variables to check for robustness and consistency of the model.

Model 1 includes the within productivity effects and the control variables, Model 2 include only the between transformation or reallocation effect and the control variables, finally Model 3 includes both the within and between effects with the control variables. Each sub-column reports the coefficients of the variables, the standard errors and the probability values. As a standard rule of thumb in econometric analysis, the coefficients are significant at less than 5% when the probability values are less than 0.05. The total number of observations included for the regression is 756.

Table 4: Regression Results of the Effects of Structural Transformation on Socio-economic Development

	Model 1 - RE			Model 2 - RE			Model 3 - FE		
Variables	**coef**	**Std. err**	**P-val**	**coef**	**Std. err**	**P-val**	**coef**	**Std. err**	**P-val**
Agricwit	0.159*	0.074	0.032	-	-	-	0.116*	0.057	0.049
Indwit	-0.007	0.062	0.909	-	-	-	0.002	0.036	0.953
Servwit	-0.032	0.067	0.631	-	-	-	-0.012	0.039	0.772
Agricbtw	-	-	-	-3.701*	0.790	0.000	-3.517*	0.802	0.000
indbtw	-	-	-	-0.309	0.317	0.330	-0.241	0.312	0.446
Servbtw	-	-	-	-0.609	0.462	0.188	-0.615	0.463	0.193
inv	0.206*	0.063	0.001	0.190*	0.062	0.002	0.195*	0.061	0.003
gov	0.158	0.146	0.277	0.163	0.148	0.269	0.158	0.151	0.302
to	-0.014	0.023	0.549	-0.019	0.022	0.386	-0.024	0.023	0.293
obs	754	-	-	754	-	-	754	-	-
R-squared	0.10	-	-	0.136	-	-	0.142	-	-
F-stat	-	-	-	-	-	-	5.690	-	0.000
Wald	23.49	-	0.000	49.71	-	0.000		-	-

Author's computation 2021

Explanatory notes: The dependent variable is HDI. Model 1 presents the results of the within effect on HDI, Model 2 presents the results of the between effect on HDI and Model 3 presents the results of both within and between effects on HDI. The following are the meaning of the acronyms used; Agricwit is agricultural between effect, Indwit is industrial within effect, Servwit is services within effect, Agricbtw is agricultural reallocation effect, Indbtw is industrial between effect, Servbtw is service between effect. The random effect (RE) regression is specified for Model 1 and 2 while the fixed effect (FE) regression is specified Model 3. Coef represents the coefficient of the variables, std.err is the robust standard error, P-val is the probability values and obs is the number of observation included in the regression. The asterisk (*) means that the coefficients are significant at less than 1% level.

From Table 4, The Wald χ^2 statistic is presented for the random effect models while the F-statistics is presented for the fixed effects regression. The two of statistics have significant probability values, indicating that the coefficients in the models are significantly jointly different from zero.

From the estimates reported on Table 3, only the coefficients of agricultural within and between effects were significant out of the 3 sectors included. The coefficients of the within (productivity) effects are positive and significant for only the agricultural sector. The coefficient of 0.12 (in Model 1 and 3) implies that *HDI* increases by 0.012 (or 0.12 percent) with a unit increase in the change agricultural productivity weighted by its employment. This result is in line with the a priori expectation in section 3 and past studies such as Cheong & Wu (2014). Conversely, the coefficients of *Agricbtw*, are negative and significant at less than 1% in Models 2 and 3.This means that a unit increase in the change in agricultural employment weighted by agricultural productivity would decrease HDI by 0.37 (or 3.7%) in Model 2 and 0.35 (or 3.5%) in Model 3. This result is also in line with the apriori expectation as it is expected that the between effects can have either positive or negative effects on HDI.

The coefficients of the industrial and services sectors are all insignificant for both the within effects. This is contrary to the apriori expectation of their effects on HDI. This lack of effect may be attributed to the lower relative employment in the sector as compared to the agricultural sector. The only control variable that has an effect on *HDI* is *inv*, with the coefficients significant at less than 5%. The coefficient values of an average of 0.2 (across the table) imply that an increase in the coefficient of *inv* will increase *HDI* averagely by 0.2.

Summary and Conclusion

The study examined the effects of structural transformation on social-economic development. Theoretically, structural transformation should lead to economic growth and development; however, this may not be the case for all countries and may not translate into socioeconomic development as explained by empirical research. The study adopted the theoretical foundations of the theory of dualism and the productivity decomposition method to specify a model for the effect of structural allocation on socio-economic development. From the decomposition result, the study found that between effects for industrial and services sector contributes positively to productivity on the average in the region, even though the total economy had an overall negative productivity. Furthermore, using the fixed and random effects regression method of estimation for a panel data of 36 Sub-Saharan African countries, the analysis of the study shows that structural transformation effect on socioeconomic development is attributed to only the agricultural sector out of the three sectors included in the model. The study found that the within productivity effect of the agricultural sector have significant positive coefficients, while the between reallocation effect have significant negative coefficients. Finally, the study also found that the coefficient of investment is significant and positive.

The study concludes that there is a positive effect of the agricultural within productivity effect on HDI and a negative effect of its between reallocation effect on HDI. This means that growth in agricultural productivity weighted by its employment improves people's welfare but the growth in agricultural employment weighted by agricultural productivity reduces the welfare of people. In other words, there is a positive productivity effect of the agricultural sector on HDI and a negative labour reallocation effect of the sector in HDI. The negative effect of the between (or reallocation) effect may be as a result of the low productivity in agriculture compare to its large labour force. More labour moving to an unproductive sector will be counterproductive leading to lower marginal productivity of labour in the sector. The study can therefore conclude that agricultural sector development is a crucial path toward productivity growth and socioeconomic development. Conversely, the industrial and services sector within and between effects do not have any effect on socioeconomic development even though they contribute to economic productivity growth via the between effect. This result is similar to that of Cheong & Wu (2014) and Samar (2017) which suggests that structural transformation may not improve socioeconomic development even if it contributes to output and productivity growth. Finally, the study concludes that there is a positive effect of investment on HDI.

The implication of this result for policy makers is to support the structural transformation process to improve socioeconomic development through agricultural sector development. This is because transformation process would mostly involve the development of the modern industrial and services sector at the expense of the traditional agricultural sector. Whereas, the sector has been found to be crucial for socioeconomic development. Labour reallocation to the agricultural sector should however be discouraged as it is detrimental for socio-economic development. This study focused on the labour allocation aspect of structural change, future research can include other important factors in the structural transformation process such as urbanization, institutions and technological advancement. These factors have not been included because they are beyond the scope of the present study.

References

Badiane, O., Ulimwengu, J., & Badibanga, T. (2012). Structural Transformation among African Economies: Patterns and performance. *Development*, *55*(4), 463–476. https://doi.org/10.1057/dev.2012.69

Bah, E. M. (2011). Structural Transformation Paths Across Countries. *Emerging Markets Finance and Trade*, *47*(sup2), 5–19. https://doi.org/10.2753/REE1540-496X4703S201

Chenery, H. B. (1960). Patterns of Industrial Growth. *The American Economic Review*, *50*(4), 624–654.

Cheong, T. S., & Wu, Y. (2014). The impacts of structural transformation and industrial upgrading on regional inequality in China.

China Economic Review, *31*, 339–350. https://doi.org/10.1016/j.chieco.2014.09.007
Dao, M. Q. (2012). Government expenditure and growth in developing countries. *Progress in Development Studies*, *12*(1), 72–82.
de Vries, G. J., Erumban, A. A., Timmer, M. P., Voskoboynikov, I., & Wu, H. X. (2012). Deconstructing the BRICs: Structural transformation and aggregate productivity growth. *Journal of Comparative Economics*, *40*(2), 211–227. https://doi.org/10.1016/j.jce.2012.02.004

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. https://doi.org/10.1080/00220388.2014.997222

Fabricant, S. (1942). *Employment in Manufacturing, 1899-1939: An Analysis of Its Relation to the Volume of Production*. https://www.nber.org/books/fabr42-1

Lewis, W. A. (1954). Economic Development with Unlimited Supplies of Labour. *The Manchester School*, *22*(2), 139–191. https://doi.org/10.1111/j.1467-9957.1954.tb00021.x
McMillan, M., Rodrik, D., & Verduzco-Gallo, Í. (2014). Globalization, Structural Change, and Productivity Growth, with an Update on Africa. *World Development*, *63*, 11–32. https://doi.org/10.1016/j.worlddev.2013.10.012
McMillan M., Rodrik D., & Sepulveda C. (2016) *Structural Change, Fundamentals, and Growth: A Framework and Case Studies*. Washington DC: IFPR.

Pernia, E. M., & Quising, P. F. (2005). Trade openness and regional development in a developing country. In *Globalization and Urban Development.* (p. 16). Springer.

Ranis, G., & Fei, J. C. H. (1961). A Theory of Economic Development. *The American Economic Review*, *51*(4), 533–565.

Romer, P. M. (1986). Increasing Returns and Long-Run Growth. *Journal of Political Economy*, *94*(5), 1002–1037.

Sarma, V., Paul, S., & Wan, G. (2017). *Structural Transformation, Growth, and Inequality: Evidence from Viet Nam*. 31.

Timmer, C. P., & Akkus, S. (2008). The Structural Transformation as a Pathway Out of Poverty: Analytics, Empirics and Politics. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1213154
UNCTAD. (2016). *Industrialization, Empoyment and Poverty*. United Nations.

Appendix

A. Countries

Countries included are; Angola, Benin, Botswana, Burkina-Faso, Burundi, Cameroon, Chad, Comoros, Congo dem, Congo rep, Cote dÍviore, Eswatini, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zimbabwe.

B. Poolability Test

	Ho: Homogenous constant			
Model	Statistics	P-value	Decision	Implication
1	85.32	0	Reject	do not pool constant
2	88.21	0	Reject	do not pool constant
3	88.48	0	Reject	do not pool constant

Source: Authors computation (2021)

C. Hausman Test

	Ho: Random effect is consistent			
Model	Statistics	P-value	Decision	Implication
1	7.03	0.318	Accept	use random effect
2	10.97	0.0894	Accept	use random effect
3	19.02	0.025	Reject	use fixed effect

Source: Authors computation (2021)

D. Autocorrelation test

	Ho: no first order autocorrelation			
Model	Statistics	P-value	Decision	Implication
1	196.758	0	Reject	Autocorrelation present
2	191.639	0	Reject	Autocorrelation present
3	192.741	0	Reject	Autocorrelation present

Source: Authors computation (2021)

E. Cross-sectional Dependence test

	Ho: No cross sectional dependence			
Model	Statistics	P-value	Decision	Implication
1	97.258	0	Reject	No cross sectional dependence
2	92.914	0	Reject	No cross sectional dependence
3	91.828	0	Reject	No cross sectional dependence

Source: Authors computation (2021)

F. Heteroscedasticity Test

	Ho: Constant variance			
Model	Statistics	P-value	Decision	Implication
1	986.68	0	Reject	heteroscedasticity present
2	1385.47	0	Reject	heteroscedasticity present
3	1200.22	0	Reject	heteroscedasticity present

Source: Authors computation (2021)

G. Multicolllinearity Test

Variable	VIF
hdi	1.02
agricwit	1.99
indwit	2.21
servwit	2.38
agricbtw	1.97
indbtw	1.7
servbtw	1.88
Mean VIF	1.88

Source: Authors computation (2021)