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STRUCTURAL CHANGE AND ECONOMIC GROWTH IN AFRICA

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STRUCTURAL CHANGE AND ECONOMIC GROWTH IN AFRICA

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Declaration

I, the undersigned, declare that this research paper is my original work and the matter embodied in this thesis work has not been submitted earlier for award of any degree to the best of my knowledge. All sources of the materials in the research paper have been duly acknowledged. Finally, I have not permitted anyone to copy my work intending to use or present it as his or her own.

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Acronyms

AEO: African Economic Outlook

BP LM: The Breusch Pagan Lagrange Multiplier test

CAR: Central African Republic

DRC: Democratic Republic of Congo

FDI: Foreign Direct Investment

FE: Fixed effect

FGLS: Fixed Generalized Least Squares

GDP: Gross Domestic Product

GGDC: The Groningen Growth and Development Center

IVAD: Industry Value added

LEXR: Log of exchange rate

LHK: Log of Human Capital

MRS: Marginal Rate of Substitution

PCGDP: Per Capita Gross DomesticProduct

R&D: Research and Development

RE: Random Effect

SADC: South African Developing countries

SSA: Sub Saharan Africa

TFP: Total Factor Productivity

TOT: Terms of Trade

WB: World Bank

Abstract

Since the late 1950s and mid 1960s which is known to be the period of African independence, Africa's growth performance and structural change, as indicated by the growth of the secondary sector, have shown a fluctuating pattern. The period between the 1950s and the mid-1970s was relatively of good economic performance and expansion of the manufacturing sector while the period after the mid-1970s to the mid-1990s is characterized by poor economic performance and contraction of the secondary sector. The period since the late 1990s is a period of rapid economic growth but declining share of the secondary sector which implies negative structural change in the context of this study. Given this pattern of economic growth and structural change, previous studies focus on the effect of structural change on economic growth of Africa. Accordingly, this study aims at analyzing the effect of economic growth on structural change in Africa.Other drivers of structural change in Africa are also studied by considering the Natural resource endowment hypothesis, Geography hypothesis, exchange rate policy hypothesis and human capital hypothesis. The effect of openness on structural change is also analyzed by considering the effect of trade on sectorial value added share.Secondary data for a set of 43 African countries for the period between 1980 to 2020 is collected from the World Bank's World Development Indicators Database. The countries and years of study are selected based on the availability of data. The fixed Generalized Least Squares (FGLS) estimation is employed to estimate the parameters as it addresses the problems of heterosckedasticity, autocorrelation and Cross-sectional dependence existing within the data. The Durbin-Hausman-Wu endogenity test is applied and the variables are found to be strictly exogenous. The result of the study shows that Economic growth has a significant negative effect on Structural change. This is consistent with the reality faced by African economies in the past decades for which economic growth and structural change move in opposite directions to each other. Particularly after the mid-1990s, the economy is growing faster but the industry sector's share in output which represents structural change, is declining. Exchange rate depreciation has also a negative effect on structural change in Africa for the last four decades. On the other hand, Human Capital and Openness has a positive effect on structural change that more improved human capital and more open economy results in an increasing share of Industry Value Added thereby facilitating structural change. Natural resource endowment and Geography are found to be insignificant variables in the model estimation. Based on the result, the study recommends those policy designs focused on: driving the fruits of economic growth towards the expansion of the industry sector,increasing investment in human capital, following more liberal trade policies and well managed exchange rate system.

Key Words: *Africa, Economic growth, structural change, Industry Value added, Per capita GDP growth, Panel Data.*

CHAPTER ONE

1. INTRODUCTION

1.1. BACKGROUND OF THE STUDY

The period between the late 1950s and early to mid-1960s is associated with political independence for African countries so African economy was expected to grow at a faster rate. However, the experienced reality was far from the expectation until the 2000s (Alemayehu, 2017). Africa experienced low GDP per capita, higher poverty rates and lower living standards, (Easterly and Levine, 1995) and, fluctuating growth patterns (Fosu, 2008) until the late 1990s.

The period between the 1950s and the mid-1970s was a period of relatively good economic performance when the annual growth rate of African countries averaged 5% and, annual per capita growth was also higher at a rate of 2%. Physical capital accumulation, total factor productivity and market oriented political institutions were the sources of growth for the period. On the other hand, Political instability resulted from the colonial legacy of high ethnic tensions is responsible for low performing economies. (Fosu, 2008)

The beginning of the 1970s marked a slowdown of growth. Particularly, the period after the mid-1970s was characterized by negative shocks resulting from higher petroleum price and, drought which contributed a lot to poor performance during the period. African economies began to experience a sharp decline in economic growth particularly in the early 1980s and the beginning of 1990s. Particularly during the 1980s, the so called *the lost decade,* average Per Capita GDP growth was negative. The source of contraction for the period was deterioration in TFP which resulted from over-investment by the state and the resulting increase in idle capacity (Fosu, 2008).

The early 1990s was a period of slow growth regardless of intensive reform efforts undertaken: annual per capita GDP growth for the period 1990-96 was -0.9%. According to (Bloom and Sachs, 1998) 47% of Africa's population lived under absolute poverty in the year 1990. The major sources of poor growth performance were political instabilities prevailing in different parts of the continent, and deterioration in TOT. (Fosu, 2008).

African economies began to experience considerable recovery since the mid-1990s with annualGDP growth rate of about 4% in the post 1995 period which further accelerated to 4.5% (excluding South Africa) in the early 2000s; The implementation of Structural Adjustment Programs (SAP) in most of the countries and the improvement in TOT of African economies associated with the global commodity price surgethe suggested sources of growth. (McMillan and Harttgen, 2014).

Structural change in Africa, since independence, exhibits a fluctuating pattern as that of economic growth. In the early post-independence period, the mid 1950s and 1960s, manufacturing industries expanded leading to a growth enhancing structural change. There was relatively rapid expansion of the manufacturing sector during the 1950 to 1975. Productivity in the manufacturing sector was 2.5 and 2.8 times the average productivity of the total economy in 1960 and 1975, respectively. Agricultural productivity was 0.5 and 0.4 times the average productivity of the total economy for the above two periods, respectively. Reallocation of labor to the manufacturing sector positively contributes to growth in the period that structural change was growth enhancing. (Timmeret.al., 2013)

However, this process of structural transformation was reversed as growth stagnated during the mid-1970s and 1980s. The process of structural change between 1975 and 1990 was slow that agriculture's share in employment was declined by only about 5.4%, from 66% in 1975 to 61.6% in 1990. (Timmeret.al., 2013). The contribution of structural change for the development process during the period was found to be negative, because labor is allocated from high productivity manufacturing sector to the nonbusiness service sector.

During the 1990s there was reallocation of labor from agriculture to market service industries with lower productivity growth than the manufacturing sector. According to (Timmeret.al., 2013). Agricultural share of employment declined from 61.6% in 1990 to 49.8% in 2010 and, that of the manufacturing sector from 8.9% to 8.3%; The employment share of the service sector was expanding from 24.1 in 1990 to 36.8 in 2010.Similarly, (Martins, 2017),put thatStructural change accounted for over 35 %(onethird) of annual average per capita GDPgrowth which was raised from 0.3 %for 1991-2002 to 2.4% 2002-2013.

A more recent study by Jha and Afrin (2016) implies that the relationship between the value added shares of different sectors and per capita GDP growth for the period 1970 to 2014 followed the general pattern of all economies of the world as put by (Sen, 2019). Accordingly, Agriculture's share of value added declined continuously with per capita GDP growth whereas the share of manufacturing exhibits a U-shaped relationship with per capita GDP, initially rising, reaching a maximum point and, finally declining. The share of the service sector on the other hand, rises continuously with per capita GDP growth. The study also underlined that the other fact about the pattern of structural change in Africa is stagnation of the manufacturing sector even though the share of the agricultural sector in the economy is declining and there was a huge rise in the share of the service sector.

1.2. STATEMENT OF THE PROBLEM

The pattern of structural change in todays advanced and developing economies follows a different pattern in terms of the sequence of the dominating sectors. For the case of todays advanced countries, the structure of the economies was directed from agriculture dominated to industry dominated and finally to service dominated ones. (Gollin et al., 2014) (Sen, 2019).On the other hand, the pattern of structural change experienced by contemporary developing countries follows a different pattern in which the economies shift from the agricultural sector dominated ones to those dominated by the service sector without passing through the second stage of structural change which is characterized by the dominance of the manufacturing sector (Nayyar, 2019) and Sen (2019).

African countries as any other developing countries are experiencing the path of structural change which is far different from that of the contemporary developed countries. Regarding this, (Lopes, 2015) concluded that contemporary developing countries including African countries are following the unusual path of structural change that is different from the theoretical basis and the historical trend of today's developed countries. Productive resources are shifting from agriculture to non-business services than the more productive manufacturing sector in Africa that is why structural change is not bringing as accelerated growth as possible.

The other important fact regarding the studies on structural change in Africa is that they focus on the role played by structural change in bringing about economic growth.Regarding these the

study conducted by McMillan and Rodrik (2011) found that structural change for the period between 1990 and 2005 was growth reducing in Africa.Similarly, McMillan and Harttgen (2014) found that structural change in Africa for the period between 1990–1999 was growth reducing that the resulting labor productivity growth was close to zero. However, growth in Africa for the period after 2000 was accompanied by structural change that about half of the growth is associated with productivity increase due to the shift of labor from agriculture to manufacturing and service sectors.

The study by McMillan et.al. (2017), on eight African low income countries for the period between 2000 and 2010 shows that the overall labor productivity growth in the period was owed to structural change that is shown by the declining employment and output share of agriculture and an increasing share of the manufacturing and service sectors. Contrary to this, (Page, 2018) also argues that structural change experienced in Africa for the period between 2000-2010 was not growth enhancing as it involves the transfer of productive resources from agriculture to the less productive service sector.

More extended study by (Salim, 2017) noted that, structural change had a growth reducing effect in SSA for the period 1980-2000 whereas it contributed positively to growth in Asia, Latin-America and North Africa over the same period. However, for the period after 2000, Africa experienced growth-enhancing structural change. Likewise, the analysis of Timmer et.al., (2013) for the period between 1990-2010 also concludes that the role of structural change for growth in Africa was negative because labor allocation was directed from high productivity manufacturing sector to the less productive service sector.

Even though, the path of Africa's structural change is found to be following the unusual path less is done by previous studies to examine the underlying reason. This study is aimed at filling this gap by examining the drivers of structural change in the continent. This is done by considering the relevance of the four major hypotheses (resource endowment including natural resource and human capital, geography and exchange rate policy) on the drivers of structural change for the case of Africa.

Moreover, the studies on structural change in Africa are concerned with examining the role of structural change in bringing about economic growth. The role of existing economic

performance in bringing about structural change or, shift of output share towards the modern sector, is not given much concern. So, this study tries to fill this gap analyzing the role of economic performance (economic growth) in the path of structural change. Furthermore, the causality between growth and structural change will also be examined so as to determine the direction of relationship between the variables, for African case.By doing so, the current study contributes for the literature on the drivers of structural change in Africa giving more emphasis on the role of economic growth for structural change.

1.3.OBJECTIVES OF THE STUDY

1.3.1. General objective

- To analyze the growth-structural change linkage and the driving factors of structural change in Africa.

1.3.2. Specific objectives

- To examine the patterns of economic growth and structural change in Africa.
- To examine the drivers of structural change in Africa
- To analyze the growth-structural change causality.

1.4. HYPOTHESES

This study aims to test the four major hypotheses on the drivers of structural change in Africa: Resource endowment, Geography, Exchange rate policy and Human Capital hypothesis.

- Resource abundant countries are disadvantaged in achieving structural change as compared to the resource scarce ones.
- Landlocked countries are disadvantaged in achieving structural change as compared to the coastal ones.
- Human capital is a significant positive determinant of structural change.
- Exchange rate depreciation positively determines structural change.

1.5. SCOPE OF THE STUDY

The study is confined to 43 African countries covering datafor the years between1980-2020. The number of countries and the study period is selected based on data availability.

1.6. SIGNIFICANCE OF THE STUDY

The study has an important contribution in providing appropriate information about the pattern of and causality between economic growth and structural change, and the drivers of structural change in the continent for the period under study. Accordingly, the study shows the contribution of economic growth, openness, exchange rate and human capital in bringing about structural change in the continent. The study can be used by policy makers for the case of decision making on the variables under consideration of the study. Moreover, it could be used as a stepping stone for further studies which are going to be done on related areas.The study in its broader terms could be applied to other developing countries of the world.

1.7. LIMITATIONS OF THE STUDY

Having much significance in the study of structural change and economic growth among African countries, the study has limitations related to the availability of data. Only 43 African countries are included in the study while those countries for which data is in short are left out of the study. Data is not also properly available for the years before 1980, thus the study considers the years between 1980 and 2020.Moreover, this study undertakes the Continent level analysis of structural change and economic growth, and the drivers of structural changeleaving the country level analysis left unconsidered. Moreover, the study considers the change in value added share of the industry sector to measure structural change without considering the employment share.

1.8. ORGANIZATION OF THE STUDY

The rest of the paper is structured as follows: the second chapter presents the theoretical and empirical Literatures on structural change andeconomic growth, and drivers of structural change. The third chapter is concerned with explaining the Data and methodology applied to estimate the variables under study. The fourth chapter presents the results of the descriptive and econometric analysis. Finally, the fifth chapter concludes and put some policy recommendations.

CHAPTER TWO

2. LITERATURE REVIEW

2.1.Theoretical Literature

2.1.1. The concept of structural change

The economics of structural change has a long story which goes back to the Classical Economics. Kuznets (1966), through the comparative approach to economic development states that modern growth is characterized by structural change which is the movement of workers from agriculture to manufacturing and service sectors. The manufacturing sector is an engine of growth as it is the rate of industrialization that differentiates successful and unsuccessful economies.

Kuznets(1966) statedstructural change inits broader terms asa product of four interrelated processes in the economy. These are: a declining share of agriculture in GDP and employment, rapid urbanization as people migrate from rural to urban areas, the rise of a modern industrial and service economy, and demographic transition from high to low rates of births and deaths. Productivity rise in the agricultural sector to become comparable to that of the other sectors (manufacturing and service), and agricultural income rise also characterizes structural change.

Accordingly, Structural change essentially indicates a qualitative transformation and evolution of the economic system, usually marked by technological progress and organizational changes which are explained by knowledge and institutions that contribute to the process of structural change. (Schilirò, 2012)

Structural Transformation refers to the movement of labor and other productive resources from less productive sectors into more productive ones. It also involves the transition of an economy from labor intensive economic activities to skill intensive ones. Moreover, the concept of structural change explains the transformation in the composition of production, employment, demand and trade which appears as a result of economic development experienced in an economy. (Doyle, 1997)

The structural change theory focuses on the mechanism that underdeveloped countries can apply to transform their economic structures from the one that heavily relies on traditional subsistence agriculture to the one that emphasizes on more modern, more urbanized and more industrially divers manufacturing and service economy. (Todaro and Smith, 2012) defined structural transformation as the process of transforming an economy in such a way that the contribution to national income by the manufacturing sector eventually surpasses the contribution by the agricultural sector. Successful economic transformation requires two key elements: raising agricultural and rural labor productivity sustainably and, diversifying into higher-valued goods in emerging higher productivity, urban-based manufacturing and service sectors. *(*Badiane and McMillan,2014).(Sen, 2019) also put that the conventional view of structural transformation is informed by three stylized facts of economic development: all economies exhibit declining employment in agriculture, a hump-shaped share of employment in industry, and an increasing share of employment in services.

2.1.2. Economic growth and structural change

Structural change and economic growth are highly interrelated economic phenomena that act as both an input and output to each other. Structural change is a key driver and an important requirement of sustained economic growth and development. Kuznets (1957), Chenery (1960).Structural change is an input for economic growth that changes in sectorial shares of employment, output and nature of production bring about productivity growth (Salim, 2017). On the other hand, productivity growth in different sectors leads to further structural transformation, i.e., productivity increase in the agricultural sector facilitates expansion of the industrial sector and the growth of the later leads to further development of the agricultural sector and expansion of the service sector. (Clark, 1940).Timmer et.al (2012), also noted that structural change is the cause and effect of economic growth.

Moreover, Echeveria (1997), building a dynamic general equilibrium model showed the mutual cause and effect relation between economic growth and composition of aggregate output, and concluded that growth and sectorial composition of output affect each other.

There is Circular Causality between Productivity Growth and Structural Change that productivity growth can cause structural change, which in turn leads to further growth in productivity. On the other hand, structural change and development may fail to materialize even

without any frictions but only due to the circular causality which is a double-edged sword, as the lack of productivity growth and the lack of structural change can reinforce each other, creating the vicious cycle of poverty. Therefore, the two-way causality between economic growth and structural change can provide possible explanations for development failures. (Matsuyama**,**2009)

2.1.3. Theories of Economic growth and Structural change

The so called *dual economy models*are one of the first models that made the inclusion of structural change into growth models possible. These models are concerned to the analysis of the determinants and outcomes of sectorial structural dynamics. However, the models were limited in scope and not fully equipped to incorporate all the driving mechanisms of structural change. (Gebardo et.al, 2017)

Dual economy models are mainly oriented to representing the first stages of an economy's development (which involves an emphasis on the balance between capital accumulation and population growth, adjusting each other). These models are based on the concept of structural heterogeneity, in which the economy is composed of two asymmetric sectors, a relatively advanced and a relatively backward sector where the asymmetries include: technological, institutional, behavioral and informational aspects. The two sectors cannot be lumped together as they follow completely different economic logics. Therefore, they differ in terms of the goods produced and the nature of the growth process, and the mechanisms of wages and employment.

In general terms, the dual economy models are characterized by and modern sectors where subsistence wages, abundance of labor, low productivity, labor-intensive production process, and lack of capital accumulation and technical progress characterize the traditional sector with a modern sector that provide by higher wages as compared to the traditional sector, possess higher marginal productivity, capital intensive production process and technical progress. Moreover, the dual economy models focus on inter-sectorial relationships and flows so, growth in these models is highly dependent on the rate of resource (labor) transfer from the traditional to the modern sector. The dual economy literatures use the terms such as capitalist and subsistence, modern and traditional, industry and agriculture, urban and rural and, primary and secondary to represent the traditional and the modern sectors.

Kuznets, lewis, chenery and syrquin are the most important figures in terms of including structural into the classical growth models.The comparative approach in development economics which is intended at relating successful economic development to the economic structure and economic policy was initiated by Simon Kuznets. Accordingly, Kuznets predicted the existence of common international factors and interactions that produce and spread economic growth around the world (Kuznets, 1959). In line with this, (Syrquin and Chenery, 1989) found that there is an inverse relationship between income and agricultural share in output and employment. After a certain point of development as productivity in manufacturing sector exceeds productivity in agriculture and service sectors, demand for the service sector expands and employment share of the service sector becomes the highest. However, in terms of output share, the industrial sector remains to be the leading.

2.1.4.The Lewis two-sector Model

(Lewis, 1954), the process of structural change is expressed by the early development theory called *the two-sector model* formulated by W. Arthur Lewis in the mid1950s. It focuses on the structural transformation of a primarily subsistence economy with surplus labor supply. According to the Lewis model, there are two sectors constituting the underdeveloped economy; a rural subsistence sector which is traditional and overpopulated, and modern urban industrial sector with high-productivity.

The model assumed the marginal productivity of rural labor equals zero so that classifies it as *surplus labor* to indicate the situation that it can be withdrawn from the traditional agricultural sector without any loss of output to move to the modern industrial sector. Urban industrial wage is assumed to be constant and, determined as a given premium over a fixed average subsistence level of wages in the traditional agricultural sector. Labor is assumed to flow from rural to urban employment due to the attractive urban wage and the high productivity differential between the two sectors. This movement of labor from the traditional to the modern sector is accompanied by expansion of output in the modern sector, and the process continues until all surplus labor in the traditional sector is absorbed. This is implied by the supply curve of rural labor to the modern sector which is assumed to be perfectly elastic at the constant urban wage. However, once all the surplus rural labor is absorbed, the marginal product of rural labor becomes greater than zero, and it is no longer possible to transfer labor with zero cost as before because of the higher cost of

lost food production. This marks the *Lewis turning point*, after which the supply curve of rural labor to the modern sector is positively sloped which implies the expansion of both employment and output in the urban sector; structural transformation. The speed of this expansion is determined by the rate of industrial investment and capital accumulation in the modern sector where all profit is assumed to be reinvested.

The Lewis Model is criticized for: the assumption that states the rate of labor transfer and employment creation in the modern sector is proportional to the rate of modern sector capital accumulation, may not hold. Because capitalists may choose to reinvest profits in more sophisticated laborsaving capital equipment rather than just duplicating the existing capital. In this case labor absorption in the modern sector declines with increasing capital accumulation in the modern sector; The assumption that surplus labor exists in rural areas while there is full employment in the urban areas is inconsistent with the result of most contemporary research that indicates the availability of little surplus labor in rural sector; The notion of a competitive modern sector labor market that guarantees the continued existence of constant real urban wages up to the point where the supply of rural surplus labor is exhausted; The assumption of diminishing returns in the modern industrial sector is not realistic that there is much evidence for increasing returns in the sector.Even though the Lewis-two sector model is criticized due to the above four assumptions that doesn't fit the realities of contemporary developing countries, it is the widely used growth model to understand the process of structural transformation in a simple way.

From the perspective of the Lewis-model and other explanations given on the role of agriculture to structural change, it is clear that agricultural transformation contributes to structural change through the process of shifting demand and supply patterns from the agricultural sector to the manufacturing and service sectors. This means, increased agricultural productivity brings increased food availability which reduces the cost/price of food for agricultural workers and increases their real incomes. The increase in real income brings increased demand for nonagricultural products which results in a shift of agricultural labor force to the non-agricultural production. This leads to the expansion of industries, services and knowledge based institutions whose productivity increase provides more benefit than the increase in productivity of the agricultural sector. This finally ends up in the shift of consumption to the industrial and service

sectors which implies shift of employment, income and output towards the later sectors so that structural change takes place. (Lopes, 2015).

2.1.5. The Neo-classical Model of Dual Economy

Jorgenson's model is one of the neoclassical models of structural change that was known to be*the neoclassical version of the Lewis dual economy model*. The model assumes two sectors: agriculture and industry. Agricultural output depends on labor and of land which is assumed to be available a fixed amount while Industrial output depends on labor and capital. The production functions have the Cobb–Douglas form, with constant returns to scale and neutral technological change. It is only those laborers employed in the advanced sector that can respond to wage differentials between employment opportunities in agriculture and industry. Industrial wage-rate is equal to the marginal product of labor. In Jorgenson's model the transfer of labor between the two sectors depends on the availability of surplus labor in the agricultural sector. if there is no agricultural surplus, all labor remains in the agricultural sector but, if any agricultural surplus is available, labor is released from the land and transferred to the manufacturing sector at an equal rate to the growth of the agricultural surplus. The model assumes that the manufacturing production requires some initial capital stock,eventhough there is no critical level of initial capital endowment below which no sustained growth is possible. Any smallest initial stock can give rise to sustained growth.Once the initial injection of capital is made, capital accumulation in the manufacturing sector continues at a rate which is dependent on the growth of the labor force in the sector and by the terms of trade between the two sectors. The modern sector is also subject to technical progress, so the more rapid is the pace of growth in the advanced sector if the more rapid is the rate of technical change, the higher is the saving ratio, and the more rapid is the rate of growth of population.Then eventually, the economy is dominated by the development of the advanced sector.

Structural change theories classify the drivers of structural change into two: sectoral differences in income elasticity of demand (demand side explanation), and sectoral differences in productivity growth (supply side explanation). (Fisher, 1935) found that structural change is the result of change in the real income which drives change in demand accompanied by change in the composition of output and employment. Increase in real income brings about a variation of MRS between different goods which results in a shift of employment towards those goods

meeting relatively higher hierarchal needs. It was also emphasized that the difference in income elasticity across sectors is the way through which income change drives structural change.

Moreover, Clark (1940) also stated on the so called the Bell's law, that the overall share of income spent on manufacturing goods (the manufacturing share of output and employment) increases at the early stages of development then stabilizes and declines at the later stages of development eventually after a certain threshold while agricultural goods exhibit a relatively lower elasticity of income. (Clark et.al., 1995)

According to Bueraet.al (2015), It is found that income elastic goods are more skilled-labor intensive. Moreover, Clark (1940) also stated on the so called the Bell's law, that the overall share of income spent on manufacturing goods (the manufacturing share of output and employment) increases at the early stages of development then stabilizes and declines at the later stages of development eventually after a certain threshold while agricultural goods exhibit a relatively lower elasticity of income. (Clark et.al., 1995)

Difference in TFP growth across sectors and changes in relative input prices also cause change in relative prices of goods. Baumol (1967), showed that unbalanced growth is a general feature of the growth process which leads to structural change on the way to assure balanced growth. Baumol used two sectors which he called the "progressive" one and the "non-progressive" one. Labor productivity in the progressive sector increases cumulatively at a constant rate because of the continuing technological progress in the sector while labor productivity is constant in the non-progressive sector. Through time, price in the non-progressive sector will rise without limit as a result of which output of the sector will decline and perhaps approaches to zero unless demand is highly inelastic. The process of balancing the economy requires the shift of labor from the progressive to the non-progressive sector which he called "the cost disease".

Change in relative prices affect the expenditure pattern among different goods given the elasticity of substitution across sectors is different from one. As described by Acomoglu and Guerrieri (2008), the existence of cross sector differences in the substitutability between capital and labor leads to the emergence of the so called the "factor rebalancing effect". The "factor rebalancing effect" implies that the most flexible sectors that have a relatively higher elasticity of substitution between capital and labor can much more easily substitute away from labor, and

become more capital intensive. Therefore, with different elasticity of factor substitution, capital-labor ratios across sectors grow at different rates leading to the shift of factor income share.

Moreover, if factor intensities in production are different among sectors, changes in the relative cost and supply of inputs results in change of relative prices which can bring about structural change. Regarding this, Caselli and Coleman (2001), argue by illustrating the case of the decreasing education cost in the first half of the 20thcentury that brought about an increased supply of skilled labor and the resulting decline in the relative price of non-agricultural goods moving resources away from agriculture.

According to the technological explanation of structural change, change in relative prices affect the expenditure pattern among different goods given the elasticity of substitution across sectors is different from one. As described by Acomoglu and Guerrieri (2008), the existence of cross sector differences in the substitutability between capital and labor leads to the emergence of the so called the "factor rebalancing effect". The "factor rebalancing effect" implies that the most flexible sectors that have a relatively higher elasticity of substitution between capital and labor can much more easily substitute away from labor, and become more capital intensive. Therefore, with different elasticity of factor substitution, capital-labor ratios across sectors grow at different rates leading to the shift of factor income share.

2.2. Empirical Literature

A mass of studies analyzed the pattern of economic development and structural change by using sectorial employment and value added data: to make comparison between a group of developed and developing countries, to compare among developing countries, and to analyze the specific case of Africa. The finding of the studies and their implications are discussed as follows in this section.

The historical pattern of structural change in todays advanced economies was directed from agricultural to industrial and finally to service sectors. The economies initially transformed from agrarian to industrial ones, and then as they become more advanced higher valued service sector took the highest share in output and employment. (Gollin et al., 2014). Accordingly, (Sen, 2019) studied the pattern of structural change around the world for the period between 1960-2010 classifying countries of the world into 3 groups, structurally developed (high income),

structurally developing (middle income) and structurally less developed (low income). For the developed ones, the share of employment in agriculture was low to start with at 20% for the period 1960–1979, and falls below 10% by the end of the period. The share of employment in nonbusiness services increases from around 40% to around 60% of total employment. The manufacturing employment share, which had already peaked for most of these economies prior to 1960, shows a steady decline, and the share of employment in business services rises steadily and almost reached the level of the share of manufacturing employment by the end of the review period. By the period 2000–2012, Services provide the largest employment share by far at 69% while more workers are employed in nonmanufacturing industry than in agriculture.

There is a remarkable fall in the share of employment in agriculture from around 60% in 1960 to around 30% in 2010, for developing countries.In more clear terms, these economies experience a rapid decline in the share of employment in agriculture from 56% in 1960–1979 to 31% in 2000–2012. This is matched by a corresponding increase in employment in nonbusiness services from around 20% to over 40% of total employment. The manufacturing employment share shows a gradual increase that the share of employment in manufacturing increased from 10% in 1970–1979 to 12% in 2000–2012. The share of employment in business services increases beginning in the 1990s. However, the average share of employment in services overtakes employment in agriculture only in the period 2000–2012.

On the other hand, the pattern of structural change experienced by contemporary developing countries is different from that of advanced economies. There is also large cross-country variation. Labor and productive resources are moving from the agricultural sector dominated ones (the first stage) to those dominated by the service sector (3^{rd} stage) to the service sector without passing through the second stage of structural change which is characterized by the dominance of the manufacturing sector. (Nayyar, 2019).Sen (2019), also showed that these economies involves the very slow movement of workers out of agriculture most of which is to nonbusiness services rather than the manufacturing sector.Agricultural employment declined from a 78% employment share in 1960–1979 to 66% in 2000–2012. The manufacturing sector shows stagnation rather than increase in employment share that a very slow increase in the share of employment from 4% in 1960–1979 to 6% in 2000–2012 was shown. The share of employment in business services is very low as well.

Duarte and Restuccia (2010), analyze the pattern of structural transformation for 29 highland middle-income economies using sectorial employment data that are obtained from the EU KLEMS data and the International Labor Organization's LABORSTA database (ILOSTAT).The finding of the study shows that all economies in the sample follow a common process of structural transformation. Accordingly, all economies exhibit declining shares of hours in agriculture, even the most advanced economies in the sample, such as the United Kingdom (UK) and the United States (US); economies at an early stage of the process of structural transformation exhibit a hump-shaped share of hours in industry, whereas this share is decreasing for economies at a more advanced stage; all economies exhibit an increasing share of hours in services. The study concluded that the gap in the structural transformation observed across economies is systematically related to the level of development that poor economies have the largest shares of hours in agriculture, while rich economies have the smallest shares. Second, economies with higher initial share of labor force in the agricultural sector has more advantage of productivity increase in transforming labor from agriculture to manufacturing than those with smaller initial share of agricultural employment.

(Salim,2017), analyzing the relevance of the dual-economy model for developing countries found that structural change had a growth enhancing effect in Asia, Latin-America and North Africa for the period 1980-2000 whereas it had a growth reducing effect for SSA over the same period. However, for the period after 2000, structural change contributed positively to economic growth in SSA and Latin America. The result of the study shows that growth-reducing structural change was experienced at country level for many economies in Africa and Latin America over the same period.

Valensisi and Davis (2011), studying the driving force behind the accelerated growth in the least developed countries with most of those in Sub-Saharan Africa between 2000 and 2009, found that the driver was not structural change rather it was rapid growth in exports of hard commodities and foreign capital inflows that expanded demand for services and imported consumer goods. The share of industrial sector was declining for most of the countries during the period and agricultural growth was very slow.

Badianne and McMillan (2014), studied the pattern of recent structural change in Africa using data for 19 African countries and 29 countries from other regions of the world over the period

1990-2005 to examine the pattern of recent structural change in Africa in comparison with that of the rest of the world. The study found that Africa's recent pattern of structural change resembles the same pattern to the historical pattern of the other regions of the world. As of 2005, Agricultural share in employment declines whereas the industry and service shares increase with rise in income. Moreover, sectorial productivity differentials also show the same pattern to that of the historical records of other regions with higher share of more productive sectors and low share of the less productive sector in the overall productivity.

McMillan et.al., (2017), undertake further analysis to investigate the change in agricultural employment share between 2000 and 2010 using the GGDC dataset for the eight low-income African countries. The result shows that the share of labor force engaged in agriculture for 2000 to 2010 declined by an average of 9.33 % whereas, the employment shares in manufacturing expanded by 1.46%, and the employment share in services expanded by 6.13%. Combining the data on employment shares with data on value-added, labor productivity in these eight low-income African countries grew at an annual average of 2.8 percent during the period, out of which 1.57% of this labor productivity growth was attributable to structural change. On the other hand, (McMillan and Rodrik, 2011) put forth that Africa experienced growth-reducing structural change until 2005.

On the other hand, (McMillan and Harttgen, 2014) argue that growth in Africa for the period between 2005-2010s was accompanied by structural change that about half of the growth is associated with productivity increase due to the transformation of labor from agriculture to manufacturing and service sectors. The manufacturing sector was expanding in over half of African economies in the period. During this period, the share of agriculture in employment was declined by 10.61% while those of manufacturing and service increased by 2.15% and 8.23 % respectively.

(Timmeret.al., 2013) going back to the 1960s and 70s found that there was rapid expansion of the manufacturing sector during the period. Productivity in the manufacturing sector for 1960 and 1975 was 2.5 and 2.8 times the average productivity of the total economy, respectively. While, agricultural productivity was 0.5 and 0.4 times the average productivity of the total economy for the above two periods, respectively. Reallocation of labor to the manufacturing sector positively contributes to growth in the period that structural change was growth

enhancing. The process of structural change between 1975 and 1990 was slow that agriculture share in employment was declined by about 5.4% only, from 66% in 1975 to 61.6% in 1990 The contribution of structural change for the development process was found to be negative during the period, because labor is allocated from high productivity manufacturing sector to the less productive service sector when a decline in agricultural share of employment from 61.6% in 1990 to 49.8% in 2010 and that of the manufacturing sector from 8.9% to 8.3% for the same period was experienced. The employment share of the service sector was expanding from 24.1 in 1990 to 36.8 in 2010.

Having the fact that Structural change is an important element of economic transformation in developing economies in general and Africa in particular, finding out the drivers of structural change in the continent appears to be very crucial. Results of studies conducted on the drivers of structural change gives emphasis on the role of agricultural transformation, urbanization, human capital development, government policies that create good macroeconomic environment, exchange rate, geography and natural resources.

Human capital development is a common feature of those countries which experienced structural change. Investment in human capital in terms of primary, secondary and tertiary educations, traditional education, skill and vocational development and, youth development involve the largest contribution to structural change. Human capital is an important determinant and accelerator of structural change due to its capacity to improve productivity in different sectors of the economy. So that, value added and employment share in all sectors will increase and, thus growth. (Pinto et.al, 2020)

Human capital accumulation is one of the most important drivers of structural change in Africa. The human capital accumulation, measured by changes in primary school completion, is positively correlated with structural transformation. This signifies the fact that skills are important requirements for the most basic jobs in the modern parts of the economy, which have to be expanded in order to accelerate structural change. According to the World Bank (2013a) report the average length of education of a worker in a formal manufacturing job in Africa is 6.5 years. This implies the fact that the level of human capital accumulation is at its lowest level as compared to what is needed to bring about rapid structural transformation and growth.

(Badanie and McMillan, 2014), blame government policy as the major factor for the lag in structural transformation in Africa. They emphasized the failure of many development policy practitioners and analysts during the time of independence for African countries in the late 1950s and early 1960s that the adopted policies didn't recognize the centrality of agriculture in stimulating growth in the industrial sector. This disincentivized agricultural production and resulted in stagnating agricultural sector in the decades after independence as the sector failed to provide rising incomes and, stimulate overall economic growth and structural change. Kibret (2018), emphasized the role of government through an influential political commitment, visionary leadership so as to bring about strong and fast structural change. However, investment in human capital and innovation can put a strong base to structural change. The study highlights the role of facilitating continental integration and free-trade in Africa and the need of looking at domestic financing sources to bring about sustainable development in the continent.

Furthermore, more open economies facilitate the import of production inputs and technology transfer which leads to more value added of the industry sector. In the same way, expanded exports also facilitate the expansion of domestic manufacturing industries. Moreover, open economies are more exposed to changes in the structure of the economy as they facilitate the transfer of technology. This leads to the development of economic activities to more technology dependent industrial production. The positive role of trade openness in the development of the industry sector is found by Khobai and Moyo (2021) for the case of SADC countries.

Expansion of foreign trade in African countries (expansion of the share of export and import) in GDP has shown to be associated with the expansion of the manufacturing sector thereby contributing to structural shift of the economy towards the industry sector. More imports mean more inputs to the manufacturing sector and, there by more manufactured output. In the same way, more exports mean more market for and more gain from manufactured outputs. This pattern results in increased manufacturing value added and increased manufactured exports. The positive role of trade openness for the expansion of the industrial sector in North Africa is also discovered by Anyanwu (2017). According to the study trade openness paves the way to growth of the manufacturing sector and the whole economy. Moreover, the study conducted by Umoh and Effiong (2013) analyzes the effect of trade openness on manufacturing performance for the case

of Nigeria covering the period 1970-2008 by employing the Auto-Regressive Distributive lag approach for Co-integration. The result of the study found that there is a significant posi

tive relationship between trade openness and manufacturing performance.

Africa has comparative advantage in natural resources as it is comparatively land-abundant and scarcely populated. Natural resources have accounted for roughly 35% of Africa's growth since2000. Agricultural commodities, timber, metals and minerals, and hydrocarbons, Resource-based raw and semi-processed goods accounted for about 80% of African export products in 2011, compared with 60% in Brazil, 40% in India and 14% in China. Moreover, most FDI in Africa are resource-related (AEO, 2013). Africa should use the advantage of its abundant natural resource and the increasing international demand of investment in natural resources so as to reap the resulting fruits of structural change. Actually, the only African country that is resource rich and succeeded to be among those in the upper-middle income, using its natural resource endowment efficiently, is Botswana. (Meaza, 2014)

Mijiyawa (2021), using four-year-average panel data for 53 African countries for the period 1995-2014 analyzed the drivers of the manufacturing sector development in Africa. The finding of the study states that exchange rate, good governance and the size of domestic market positively contributes to structural transformation in Africa. The study emphasizes that manufacturing development is affected strongly by factors other than income so that it is important to tackle the key obstacles by working positively on the above listed and other drivers of manufacturing development.

Overvaluation of currency applied in Latin America and Africa in the 1960s and 70s as a tool of implementing the import substitution strategy resulted in a sharp decline of exports and domestic production linkages. However, it was initially aimed to stimulate the import of capital goods to the infant domestic manufacturing industries (Mijeyawa, 2021). On the other hand, (Haile, 2019) depreciation helps the expansion of the manufacturing sector and, encourage and diversify exports. This shows the impact of exchange rate on the expansion of the manufacturing sector and its exports which then affects the pace of structural change in the economy. Therefore, the approach of economies to exchange rate, appreciation and depreciation, has an enormous negative and positive impact on structural transformation, respectively.

Bloom and Sachs (1998), Even though there are many suggested reasons to the backwardness of Africa's economic performance and low level of structural change, the most important one is its extraordinarily disadvantageous geography. Added to the fact that tropical regions as a whole perform economically less (poorer) than those of temperate regions, Africa's geographical environment (climate, soils, topography and disease ecology) are contributing negatively to its poor performance by lowering agricultural productivity, increasing disease burdens and leaving its international trade at its lower level. Low agricultural productivity contributes to the lag in manufacturing development and structural change in Africa.

Moreover, geographical difference among economies is the root of difference in capability of diversification (of production and export) i.e., geography is the source of opportunity and limitations for diversification, and thereby structural change. (Hidalgo et.al.,2007) It remained to be one of the major challenges of growth for Africa owing to the fact that most of African countries are landlocked. According to (Collier and Venables, 2008), this greatly affected the effectiveness of trade and export diversification in Africa and, makes a faster manufacturing sector expansion to be difficult. As a result of this, geography is one of the most important factors that stand against structural change in Africa.

2.3. The Drivers of Structural Change in Africa: The four major hypotheses

The underlying explanations for structural change in Africa are summarized in the four major hypotheses that states natural resource, human capital, geography and exchange rate as the major drivers of structural change.

Natural resource endowment has significant implications on the process of structural transformation. (Collier, 2006), indicated that resource rich countries are unlikely to be successful in export diversification which is an important component of structural change. Mcmillan and Rodrik (2011), also reflect the same conclusion that countries with a relatively larger share of natural resource in exports experience a growth-reducing structural change in Africa. This is because the extractive (natural resource) sector cannot absorb the surplus labor from agriculture even though productivity is high in the former sector.

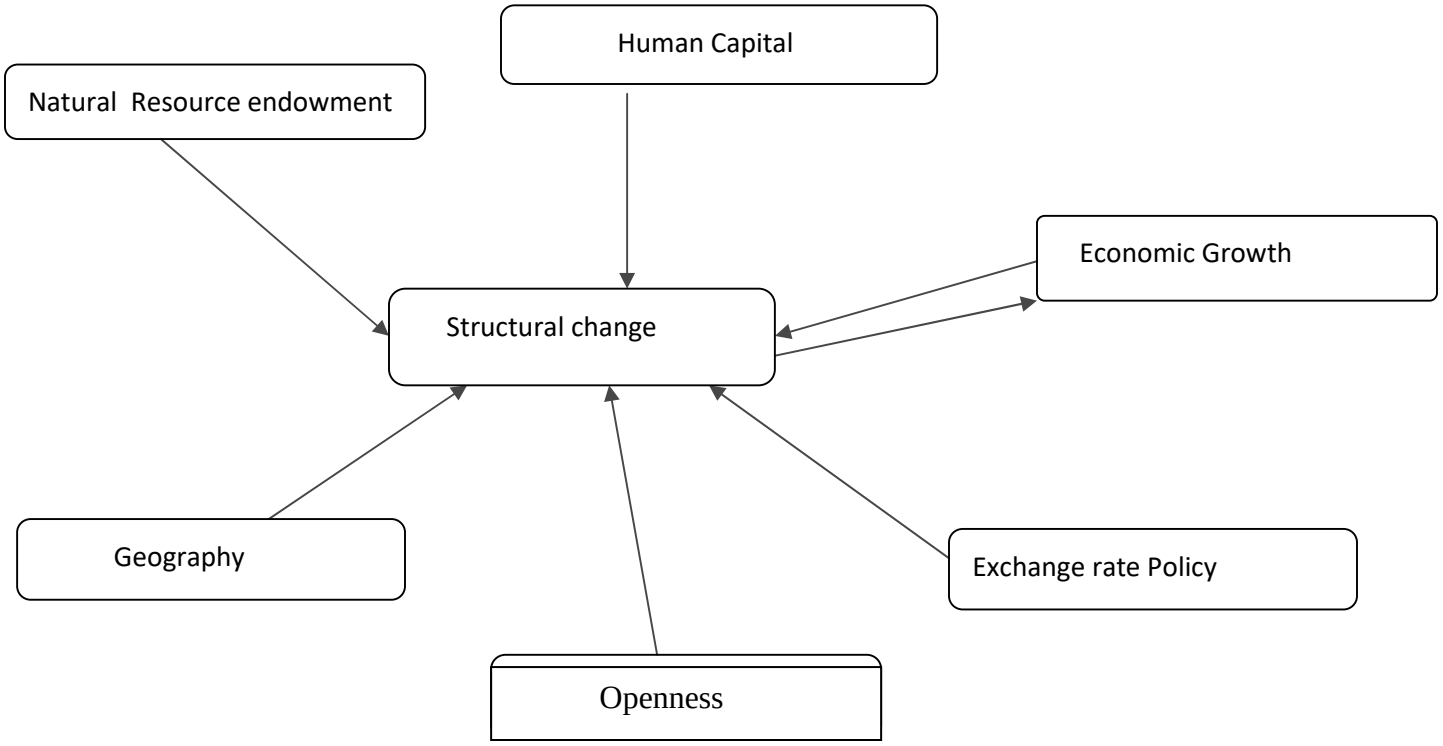
Geography greatly contributes to structural change that geographical difference among economies is the root of difference in capability of diversification (of production and export) i.e., geography is the source of opportunity and limitations for diversification, and thereby structural change. (Hidalgo et.al.,2007) It remained to be one of the major challenges of growth for Africa owing to the fact that most of African countries are landlocked. According to (Collier and Venables, 2008), this greatly affected the effectiveness of trade and export diversification in Africa and, makes a faster manufacturing sector expansion to be difficult. As a result of this, geography is one of the most important factors that stand against structural change in Africa.

Human capital is one of the most important drivers of economic growth and structural change. According to Acemoglu (1998), improved human capital puts pressure on the expansion of more productive sectors. More skilled labor in the economy means an increased supply of labor to be employed in more skilled labor-intensive sectors (the manufacturing and services). If this increased supply of skilled labor is coincided with higher productivity in those sectors it leads to the shift of labor away from the less skilled labor-intensive sector (agriculture). More importantly (McMillan and Harttgen, 2014) emphasizes that given a larger initial share of agriculture in employment and higher productivity in the manufacturing and service sectors, increase in educated labor force is followed by an intensive and productivity enhancing shift of labor from the agricultural to the manufacturing and service sectors.

Policy effectiveness is the other important driver of structural change in Africa. According to the study of (Haile, 2019), competitive or undervalued exchange rate accelerates growth enhancing structural change in Africa. Exchange rate depreciation encourages the expansion of the manufacturing sector, which in turn encourages and diversifies exports thus, accelerates the process of structural change. Similarly, (Mcmillan and Rodrik, 2011) stated that currency depreciation increases the price of tradable and encourages firms to undertake new investments so as to be engaged in new export markets which contributes to the expansion of domestic manufacturing industries and thereby bring about structural change.

2.4. Conceptual Framework

Fig 2.1. The drivers of structural change



The above model explains that structural change is determined by six major factors; Natural resource endowment, geography, human capital, economic growth, exchange rate policy and openness. Natural resource endowment is one of the major factors that affect structural change. It affects the potential of an economy to achieve structural change through its impact on the composition of exports. According to the endowment thesis, higher natural resource endowment relative to human capital makes Africa lacked the comparative advantage in exports of labor intensive manufactures (Wood and Mayer, 1998). Mcmillan and Rodrik (2011) also found that countries with a relatively larger share of natural resource in exports experience a growth-reducing structural change in Africa.

Geography is the other factor affecting structural change through its impact on the potential of export diversification. Being located around coasts is of an enormous advantage in terms of

getting the access to foreign markets, and diversifies exports so as to bring about structural change. According to the geography thesis (bloom and Sachs, 1998), Coastal African countries have large potential in export of labor intensive manufacturing. On the other hand, landlocked countries are disadvantaged in terms of achieving structural change through export diversification because, distance from potential trading partners negatively affects the growth of manufactured exports by increasing the transaction cost. (Elbadawi et al., 2001)

Policy effectiveness is an important driver of structural change. Competitive exchange rates encourage domestic manufacturing investments thereby shifting the composition of exports and, leading to structural change. Regarding this, (Elbadawi, 1998) underlined that competitive and stable exchange rate accelerates export diversification and over all export growth. (Mcmillan andRodrik, 2011) and (Haile, 2019), also found that currency depreciation stimulates the growth of Africa's manufacturing sector.

Human capital drives structural change by stimulating innovation and improving the absorptive capacity of domestic manufacturing sectors (Romer, 1990). The positive role of human capital investment is underlined by Mengiste (2009) that human capital promotes structural change by ensuring vertical and horizontal diversification. Moreover, (McMillan and Harttgen, 2014) found that given a larger initial share of agriculture in employment and, higher productivity in the manufacturing and service sectors, increase in educated labor force is followed by an intensive and productivity enhancing shift of labor from the agricultural to the manufacturing and service sectors.

Economic growth drives structural change by shifting the demand patterns in the economy. Income rises are followed by change in sectorial composition of output and employment which initially shifts from agriculture to manufacturing and, from manufacturing to service sectors at later stages of growth (Clark, 1940). Moreover, Fisher (1935) also stated that increase in real income brings about a variation of MRS between different goods and results in a shift of employment towards those goods meeting relatively higher hierarchal needs. Arthur Lewis (1954) also emphasized the role of economic growth on structural change noting that there is accelerated structural change in boom periods and the rate of structural change is lower in recession.

Openness is one of the most important drivers of structural change that helps economies to reap the benefits of trade in bringing about the expansion of the modern sector. Trade openness facilitates the access to export and import of commodities to and from abroad. More open (liberal) economies facilitate the import of production inputs and technology transfer which lead to more value added of the industry sector of African economies as it is more dependent on imported inputs. In the same way, expanded Exports also facilitate the expansion of domestic countries manufacturing industries. Studies by Anyanwu (2017) for the case of North African countries and Khobai and Moyo (2021) for the case of South African countries, examining the effect of trade openness on the expansion of the manufacturing and the industrial sector, both found a positive role of openness on industrial performance.

Structural change and economic growth are highly interrelated economic phenomena that act as both an input and output to each other. Structural change is an important driver of economic growth that changes in sectorial shares of employment, output and nature of production bring about overall productivity growth (Kuznets, 1957). On the other hand, productivity growth in different sectors leads to further structural transformation, i.e., productivity increase in the agricultural sector facilitates expansion of the industrial sector and, the growth of the later leads to further development of the agricultural sector and expansion of the service sector due to the respective shift of demand (Clark, 1940)

CHAPTER THREE

3. METHODOLOGY

3.1. Data type, source and measurement units

The study uses panel data constituting 43 African countries for the period 1980-2020. The countries and the study period are selected based on the availability of data on the interest variables. The Annual data on Industrial value added (measured as % of GDP), per-capita GDP growth (annual percentage), Human capital (measured by primary school completion rate), Official exchange rate (measured in terms of local currency per unit of USD), Openness (measured as the ratio of the sum of export and import to GDP) and Natural resource endowment (measured as arable land per 100person) and Geography measured as a dummy variable for being a Coastal country.

The countries covered in the study include: Algeria, Benin, Botswana, Burkina-Faso, Burundi, Cape-Verde, Cameroon, Central African Republic, Chad, Comoros, Congo Democratic Republic, The Congo Republic, Cote d'Ivoire, Egypt, Equatorial Guinea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Seychelles, South-Africa, Tanzania, Togo, Tunisia, Uganda, Zambia and Zimbabwe. The study dropped those countries with more incomplete data.

The data on all variables is collected from the World Bank's World Development indicators database (WB, 2022).

3.2. Theoretical Model

Syrquin (2008) devised an accounting identity that relates sectorial value added with potential drivers which are responsible for any change in sectorial contribution. The specification is based on the analysis of the factors associated with the path of industrialization followed by today's industrialized economies and the ones which entered to the path of industrialization after the Second World War.

The identity specifies sectorial value added as a function of final demand, intermediate demand and net trade for the specific sectorial output. Syrquin derived the identity for sectorial value added from the nation income identity. Therefore, it starts by stating the national income identity as:

$$\boldsymbol{Y = C + I + G + (X - M)} \ldots\ldots\ldots\ldots \textbf{(1)}$$

Where, Y is gross domestic product, C is private consumption, G is government consumption, I is gross investment, E is exports and M is imports.

C+I+G represent domestic demand (D) and +(X-M) represent net trade (T).

Therefore, the above identity can be rewritten as:

$$\boldsymbol{Y = D + T} \ldots\ldots\ldots\ldots\ldots\ldots \textbf{(2)}$$

Expanding (2) for the case of sectorial output,

$$\boldsymbol{V_j = v_j X_j = v_j\,(W_j + D_j + T_j)} \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where,V_j is value added of sector j, $X_j$is gross output of sector j, W_j is intermediate demand for the output of sector j, $D_j$is domestic final demand for the output of sector j, $T_j$is net trade for the the sectorial output and vj is the value-added ratio in sector j.

The model puts sectoral value added as a function of final uses of income on the sectoral output. i.e, the expansion of a given sector and the resulting structural shift towards a specific sector depends on how much of the national income is the expended on the production of a given specific sector. Accordingly, any factor that can affect the intermediate and/or final demand and/or net trade pattern of the sector affects the value added of the specific sector.

3.3. Definition of the variables and expected Signs

The dependent and independent variables under study are defined and, the expected signs for the explanatory variables are presented as follows:

Industry Value added share in GDP: is the share of the industry sector's output in the total outputof all sectors (WB, 2022).This measure compares the output contribution of the industry

sector with those of agricultural and service sectors. Industry value added is used as a proxy for structural change in the study that more industry Value added means a shift in the output composition of the economy towards the industry sector which is an important indicator of structural change.

Per capita GDP growth: is the growth rate of per capita GDP per year. It is measured as the growth rate of the ratio of GDP to total population (WB, 2022). It is a good measure of economic performance as it shows the per person income progress in the economy. Economic growth is one of the important factors that affect intermediate and final demand for the outputs of a specific sector, particularly, the demand for industrial production rises with rising income. Therefore, it is an important input for structural change or improvement in industry value added because, at lower income levels, significant rise in income leads to the shift of demand from agricultural products towards manufactured goods (Clark, 1940),Fisher (1935). Therefore, economic growth by shifting the demand pattern in the economy leads to structural change or shift of production and employment towards the more productive industry sector. Accordingly, this study expects positive relationship between per capita GDP growth and Industry value added share of GDP.

Human capital: refers to the value of human resource available in a given economy. Human Capital is the result of the investment made in human resource in the form of investment in health, education and training (Todaro and Smith, 2012). In this study, human capital is measured by primary school completion rate (WB, 2022). It is obvious that human resource with better education can perform better. The improved performance in turn leads to productivity growth, and results in the shift of economic activities towards more productive and skilled-labor-requiring industry and service sectors. This way improved human capital puts pressure on the expansion of more productive sectors because, more skilled labor in the economy means an increased supply of labor to be employed in more skilled labor-intensive sectors(Pinto et.al, 2020), (Acemoglu, 1998). Accordingly, the study expects positive relationship between human capital and Industrial value added.

Exchange rate: the rate at which the currency of a given country is exchanged for the currency of other foreign country. According to WB data (2022). It is particularly the rate at which a given currency is exchanged for USD. This study used the official exchange rate data which is

available for the countries under study. Exchange rate policy, whether it is allowed to be competitive or not determines the path of structural change through Industrial value added. Competitive or devalued exchange rate facilitates exports of domestic manufacturing industries as the price of dollar is higher in terms of domestic currency. Expanded manufacturing output mean expanded industry value added share in GDP (Haile, 2019), (Mcmillan and Rodrik, 2011). Based on this fact this study expects positive relationship between higher exchange rate and Industry Value added.

Openness: is the measure of the share of foreign trade in GDP. It is an indicator of how much an economy is involving in trade with foreign countries. It is measured as the ratio of the sum of export and import volume to GDP (WB, 2022). Openness is an important factor that possess the potential determining the levels of net trade for a specific sector's output, the industrial sector for this case. More open economies facilitate the import of production inputs and technology transfer which leads to more value added of the industry sector. In the same way, expanded Exports also facilitate the expansion of domestic manufacturing industries (Anyanwu (2017), Khobai and Moyo (2021). Moreover, open economies are more exposed to changes in the structure of the economy as they facilitate the transfer of technology. This leads to the development of economic activities to more technology dependent industrial production. Based on those facts positive relationship of Openness and Industry value added is expected.

Natural Capital: is the value of productive natural resources available in an economy. Different measures are available to measure natural resource endowment. The share of total land area used for arable and permanent crops, Arable land (hectar per person), the annual volume of renewable water resource per unit of total land area and value of known mineral, metal and fuel reserves per total land area (Wood and Mayer, 1998). This study used hectares of Arable land per person to measure natural resource endowment of the countries (WB, 2022). This variable is considered with the objective of testing the resource endowment hypothesis regarding the expansion of manufacturing industries. The hypothesis considers the negative effect of higher natural resource endowment relative to human capital on the expansion of manufacturing industries and their exports(Wood and Mayer, 1998). The study by Mcmillan and Rodrik (2011)also concluded the same relationship to exist between natural resource endowment and industrial expansion for the

case of Africa. Accordingly, the study expects negative relationship of natural resource endowment (land per capita) and industry value added.

Geography is a dummy variable which implies either the country is Coastal or land locked. According to the geography hypothesis of structural change, geography affects structural change through its impact on the potential of export diversification. Being located around coasts is of an enormous advantage in terms of getting the access to foreign markets and diversifying exports to manufactured ones (Elbadawi et al., 2001).Coastal African countries have large potential in export of labor intensive manufacturing, and shifting the structure of their economies while the landlocked ones are disadvantaged because of higher transaction costs associated with the farthest geographical location from the coast(bloom and Sachs (1998). Based on this assumption, the current study expects positive relationship of Coastal Geography with Industry Value Added.

3.4. Model specification

In this study, structural change is measured by Industrial value addedwhich shows the share of industrial output in total value added.Rise in Industry value added means an increasing share of output is contributed by the industry sector implying that there are some changes in the relative sectorial dominance among the three sectors in which case the contribution of the industrial sector is increasing.

The study specified an empirical model to analyze the drivers of structural change based on the sectorial transformation identity devised by Syrquin (2008) which specified sectorial value added as a function of sectorial intermediate and final demand, and sectorial net trade.Therefore, any factor that affects one of these elements of sectorial value added leads to change in the sectorial composition of economic activities in a given system which implies structural change of the economy. Accordingly, this study assuming economic growth as a determinant of intermediate and final sectorial demand and, trade openness as a determinant of sectorial net trade can affect Industry value added together with the other variables specified in the model.

Moreover, the empirical model analyzes the effects of resource (natural and human capital) endowment, geography (transaction cost) and exchange rate competitiveness (policy effectiveness) proposed by (Wood and Mayer, 1998) (Elbadawi et al., 2001)Elbadawi, 1998),

respectively with the aim of testing the hypothesis given on the drivers of structural change.Accordingly, the econometric model to be estimated is specified as follows:

$$IVAD_{it}=\alpha+\beta_1 GDPgrowth_{it}+\beta_2 ER_{it}+\beta_3 HK_{it}+\beta_4 Opp_{it}+\beta_5 NK_{it}+\beta_6 Geo_{it}+u_i+\varepsilon_{it}$$

Where,$\boldsymbol{IVAD_{it}}$is the share of industry value added in GDP for country i in year t;

PCGDPgrowthis per capita GDP growth which is a measure for economic growth

***HK*:** human capital measured in primary school completion rate;

***EXR*:**exchange rate policy;

Opp: is trade openness measured as the ratio of the sum of import and export to GDP,

NK: Natural Capital which is measured by Land per capita,

Geo: is Geography, a dummy variable which takes the value of 1 for Coastal countries and 0 for the land locked ones.

$\boldsymbol{U_i}$: country effect, **ε**: the panel error term with group and time dimensions;

α, the constant; $\boldsymbol{\beta_1, \beta_2, \beta_3, \beta_4, \beta_5}$**and** $\boldsymbol{\beta_6}$are parameters that measure the effect of the respective explanatory variables on structural change.

Table 3.1. Definition, measurement and expected signs of variables

Variables	**Measurement**	**Expected Sign**	**Source**
Per-capita GDP growth	is the growth rate of per capita GDP per year	+	WB, WDI database
Human Capital	Primary school completion rate	+	WB, WDI database
Exchange Rate	the rate at which a given currency is exchanged for USD	+	WB, WDI database
Land Per Capita	Arable land (hectar per person)	-	WB, WDI database
Openness	the ratio of the sum of export and import volume to GDP	+	WB, WDI database

Geography	Being a coastal country	+	WB, WDI database

3.5. Method of data analysis

Both descriptive and econometric techniques of data analysis are employed in the study. Descriptive analysis will be employed to present the trend of economic growth and structural change in Africa during low (1980-1995) and high growth episode periods (1996-2020). The drivers of structural change are analyzed by using fixed effects model after employing BP LM test for random effects and Hausmann's test for fixed effects. The granger causality model is applied to examine the causality between economic growth and structural change.

3.6. Estimation Techniques

3.6.1. Panel Data estimation Models

Panel data is a type of data which is composed of both cross-sectional and time-series elements. Panel data is collected for the same individuals at different time at a yearly, quarterly, monthly, weekly or daily basis. Panel data is more advantageous for econometric analysis than cross sectional and time series data because of its two dimensional feature, considering both cross sectional and time series dimensions.Therefore, it is possible to have a larger sample which provides more degrees of freedom, more variability and more information about the variables whereas allowing less multicollinearity among the variables. Panel data controls cross sectional and time series heterogeneities which is impossible with pure cross section or time-series. Panel data makes this two dimensional analysis possible by using the two-way error component assumption for the disturbance term. (Baltagi, 2005)

Moreover, panel data is important to study dynamics of adjustment in economic variables which cannot be investigated by cross-sectional data only. The fact that most economic variables are of dynamic nature makes panel data more advantageous. But, it is possible by making use of panel data. Particularly, Long panels are most suited to analyze the speed of adjustment for any economic policy shock. (Gujarati, 2004) (Baltagi, 2005)

A typical panel data model can be specified as:

$y_{it} = \alpha + \beta X_{it} + u_{it,}$ where i=1….N and t=1….T

$y_{it}$is the value of the dependent variable for individual i at time t, $X_{it}$the value of a given explanatory variable for an individual i at time t, α is the common intercept for all explanatory variables and β is the slope coefficient of the explanatory variable.

The error term is decomposed into *with-in component and panel component*. The *with-in component* consists of the individual and time heterogeneities.

$$\text{i.e, } u_{it} = \mu_i + \delta_t + v_{it},$$

where, u_{it} is the disturbance term,

μ_i: individual heterogeneity which implies unobserved individual-specific effect that is not explicitly included in the regression and remains constant over time.

δ_t: time heterogeneity which implies time specific effects which is constant across entities and it represents the *with-in* component and,

$v_{it}$is the idiosyncratic error term which represents the panel (between) component. It varies with individuals and time.

A Panel data set can be estimated by using pooled OLS, Fixed Effects (FE) or Random (RE) Effects estimation models.

i. Pooled OLS

A pooled OLS is employed if there is no significant cross sectional and time-series heterogeneity. Assume a model:

$y_{it} = \beta_1 + \beta_2 x_{it} + \beta_3 z_{it} + u_{it}$, $u_{it} \sim$ IID $(0, \sigma_u^2)$; i = 1, 2, …N; t = 1, 2,.., T

The model assigns a common intercept for the explanatory variables and, common slope coefficient across individuals and time, for each explanatory variable.

The parameter estimates of pooled OLS are highly statistically significant and R^2 for the model is very high.

On the other hand, pooling a panel data set may result in heterogeneity camouflage in the presence of individual and time heterogeneities as this heterogeneity is subsumed in the error

term. This results in correlation between the explanatory variables and the error term, the so called endogenity problem, leaving the model biased and inconsistent. (Gujarati, 2004)

ii. The fixed effects model

Either a given panel data model is of fixed effect or random effect is determined by the assumption made about the with-in error component ($\mu_i \; and/or \; \delta_t$) of the disturbance. The model is a Fixed Effect (FE) Model if the with in component is assumed to be a fixed parameter to be estimated.

The FE model is used when we are studying a specific set of N individuals, like, firms, states or countries, and the inference is based on the behavior of the observed individuals. In the Fixed Effects model the idiosyncratic error term (v_{it}) is assumed to be uncorrelated with the explanatory variables (x_{it})but, it allows correlation of the individual and time effects ($\mu_i and \; \delta_t$) with the explanatory variables ($x_{it}{}'s$). (Baltagi, 2005),

Fixed effect estimation model is employed when there is significant temporal or cross-sectional effect and, the individual and/or time specific error component is assumed to be fixed. It is used to analyze the impact of time-varying explanatory variables on the outcome variable exploring their relationship in an entity. Fixed effects model removes the effect of time-invariant variables to control the possible bias they can pose to the predictor and response variables. This is because of the fact that an individual effect is unique to an individual and should not be correlated to other individuals characteristics (Cov (ui, uj)=0). Fixed effect model also controls for time effects when the outcome variable is affected by unexpected variation or special events.(Hasoi, 2003)

Assume a model: $y_{it} = \beta_1 x_{it} + \beta_2 z_{it} + u_{it},$

No common intercept is assigned for all the variables. The fixed intercept is not explicitly included in the model; it is rather subsumed under the error component.

iii. Random Effects Estimation model

A panel data model is a Random Effect (RE) Model if the with-in component of the disturbance term ($\mu_i and \; \delta_t$) is assumed to be random and, identically and independently distributed (iid) with-in and between each other. Moreover, the individual and time-specific effects ($\mu_i and \; \delta_t$)

are independent of the idiosyncratic error term (v_{it}). It is also called the error components model (ECM) because the random effects model considers both the individual error component and the combined time-serious and cross sectional error component. (Baltagi, 2005),

The RE modeling is appropriate when a set of N individuals are randomly selected from a given large population. Therefore, the inference for the whole population is based on the behavior of the randomly selected samples. The random effects model assumes independence of the exogenous variables (x_{it}'s) with the individual and time effects ($\mu_i and\ \delta_t$). i.e., Cov ($x_{it,}\mu_i$) = 0 $and\ Cov\ (xit, \delta_t) = 0$.(Gujarati, 2004)

A model of such type which considers both the individual and time heterogeneities is called a two-way model whereas a panel data model considering only one of the two effects (individual or time heterogeneity) is called a one way model.

3.6.2. Selection tests for panel data models

Specification tests are employed in the selection of the appropriate model in the analysis of panel data. The result of the tests is used to select among the pooled OLS, fixed effects and random effects models. Among these the Poolability test (Pooled OLS and fixed effects), Hausmann test (fixed effect or random effect) and the Breusch Pagan Lagrange Multiplier (the BP LM)test(Pooled OLS or random effects) are employed in this study so as to be able to select the appropriate model to estimate the data.

i. Poolability test

Poolability test is a way of testing whether a given panel data set is poolable or not. In other words, it is a way of testing whether there is individual and time effect among the group elements (the individual units under study). If there is no significant heterogeneity across cross sections and across time then the data can be pooled and the individual units can take a common intercept. On the other hand, the presence of individual heterogeneity implies that the data cannot be pooled rather each individual unit has its own fixed intercept. Then, the pooled estimation cannot be employed but, the fixed effects model is appropriate.

The F-test or the chow-test is one of the tests for poolability and, it is based on the comparison of the restricted (the null model) and unrestricted model (the alternative model). The restricted

model assumes no significant individual and/or time heterogeneity and, the alternative hypothesis assumes significant heterogeneity among the individual units and/or across time. i.e.,

Ho: $\mu_i = 0$,

H1: $\mu_i \neq 0$, for i= 1….I

ii. The BP LM test for random effects

The standard Breusch-pagan Lagrange multiplier test for random effects is devised by Breusch and Pagan (1980). The null of the BP LM test states no random effects assuming no serial autocorrelation. The test is used to check whether there is significant random effect of the individual units, i.e., whether or not the individual effect is random. Accordingly, the null hypothesis of the LM test is that the variance of the individual and/or time-specific error component is zero. This mean the individual fixed effect is constant across individual units implying that there is no significant individual random effect. The BP LM test checks the significance of the null hypothesis against its alternative which states significant variation of the composite error term due to the individual/time random effect.

Ho: Var (u_i)=0

H1: Var (u) ≠ 0, for i=1…….I

iii. Hausmann specification test

The Hausmann specification test proposed by Hausmann (1978) is a test of selection between fixed and random effect model. It is based on the existence of correlation between the explanatory variables and the individual specific effect in a panel data model. This is done by comparing the two estimators and examining the existence of any significant difference between the two, the so called the fixed effects and random effects estimators. If the difference is significant then the individual effect is correlated with the explanatory variables and the fixed effects model is efficient but the random effects model is not consistent. On the other hand, if the difference between the estimators is not significant then this implies no correlation of the individual effect with the explanatory variables. In this case both the fixed effect and random effect are consistent but the random effect is more efficient.

The null hypothesis of Hausmann test assumes no significant difference between the fixed effect and random effect estimators whereas the alternative hypothesis assumes significant difference between the two estimators. i.e,

Ho: there is no systematic difference between the estimates of the fixed effect and the random effect.

H1: the estimates of the fixed effect model and the random effect model are systematically different.

3.7. Causality test

In order to check the causality between economic growth and structural change in Africa,the following model isestimated based on the granger causality test(Gujarati, 2009).

$$PCGDPgrowth_{it} = \sum_{i=n} \alpha_i IVAD_{i,t-1} + \sum \beta_j PCGDP\ growt_{i,t-1} + \varepsilon_{1,it}$$

$$IVAD_{it} = \sum_{i=n} \gamma_i IVAD_{i,t-1} + \sum \delta_j PCGDP\ growth_{i,t-1} + \varepsilon_{2,it}$$

Where,$PCGDPgrowth_{it}$*and*$IVAD_{it}$is economic growth and industrial value added of country i at agiven year t and, $IVAD_{i,t-1}$ and $\beta_j\ PCGDP\ growth_{i,t-1}$ *are*economic growth and industrial value added of country i at a given year t-1.

3.8.Model Diagnostic tests

Post estimation tests (diagnostic tests) are aimed at testing the reliability of the model estimates. The tests are used to check whether the assumptions underlying the model of estimation are appropriately met or not. Accordingly, there are some differences in the assumptions of the pooled OLS, Fixed effects and Random effects models.

The Pooled OLS assumes strict exogenity of the explanatory variables, homosekdasticity, non-autocorrelation and no cross-sectional dependence of the idiosyncratic error term. Violation in any one of these assumptions leads to inconsistent OLS estimates. On the other hand, the random effects model adds strict exogenity and homogeneity of the random error effect to the above assumptions of the pooled OLS. The fixed effects model assumesStrictexogenity of the explanatory variables, homosekdasticity, non-autocorrelation and no cross-sectional dependence of the idiosyncratic error term and,possible endogenity of the individual fixed effect.

Specification tests are designed so as to test if there is any problem with the model selected to estimate the data.TheBreusch pagan test of hetterosckedasticity (Breusch and Pagan, 1979), and the LangrangeMultiplier test drived by Baltagi and Li, (1995)for autocorrelation are employed to test whether or not the important assumptions of homoskedastic and non-autocorrelated error variances are hold.Cross sectional dependence test devised by Pesaran (2004) *thePesaran CD test*is employed to check whether or not the problem of contemporaneous correlation exists among the cross-sectional errors. Durbin Watson and Hausman-Wu test (1974) for the presence of endogenity, is used to check that the assumption of strict exogenity of the idiosynchratic error term is fulfilled or not. Test of perfect multicollinearity is applied by using the Variance inflation factor (Vif).

CHAPTER FOUR

4. RESULTS AND DISCUSSION

4.1. Descriptive Statistics

Table (4.1.) shows the mean and standard deviation of the variables across year and across countries. Accordingly, Exchange rate shows the highest standard deviation while the least standard deviation is that of landpercapita.

Table 4.1. Descriptive statistics

Variable	Mean	Std. Dev	Min	Max
IVAD	25.4955	12.72213	4.469673	84.34919
PCGDP growth	1.152622	6.44882	-47.50324	140.367
Openness	0.5930	0.2959	0.0629	1.8965
LAND per capita	0.2904573	0.4401715	0.0015439	10.45778
EXR	9555562	1.75e+08	1.46e-11	6.72e+09
HK	92.88754	27.71747	17.29208	177.5815

Source: own computation using Stata 14

The Average of **Industrial value added** is over 25% of GDP. Industrial value added share has the lowest value at 4.5% which is recorded for Uganda in 1980 whereas the maximum is 84% in Equatorial Guinea for the year 2008.

Per capita GDP has an average growth rate of more than 1%. The minimum Per Capita GDP growth is recorded for Rwanda at a rate of about -47.5% in 1994, and the highest for equatorial-Guinea with a rate of about 140% in 1996.

Trade Opennesshas a mean valueabout 0.59 which implies that 59% of GDP of African countries are associated with international trade (import and export) with an overall variation of about 30%. A minimum value is recorded for Burundi in the year 1997 and shows 6% of GDP is contributed by foreign trade.Themaximum is 1.8965 for Seychelles in 2015 mean about 190% of GDP is accounted by foreign trade.

Land per Capita has an average value of 0.29 hectares per person with a 44% variation. The maximum value for Land Per Capita is about 10.46 hectares per person which is registered for Cape Verde in the year 2019. Seychelles has the minimum land per capita of about 0.002 hectares per person in 2011.

The mean value of **Exchange Rate** is 9,555,562. The highest official exchange rate of 6,723,052,073 is recorded for Zimbabwe in the year 2006 while the lowest exchange rate of 1.4608E-11 is experienced by Congo DR in 2010. Exchange rate shows the largest variation across individuals with a standard deviation of 1.75e+08.

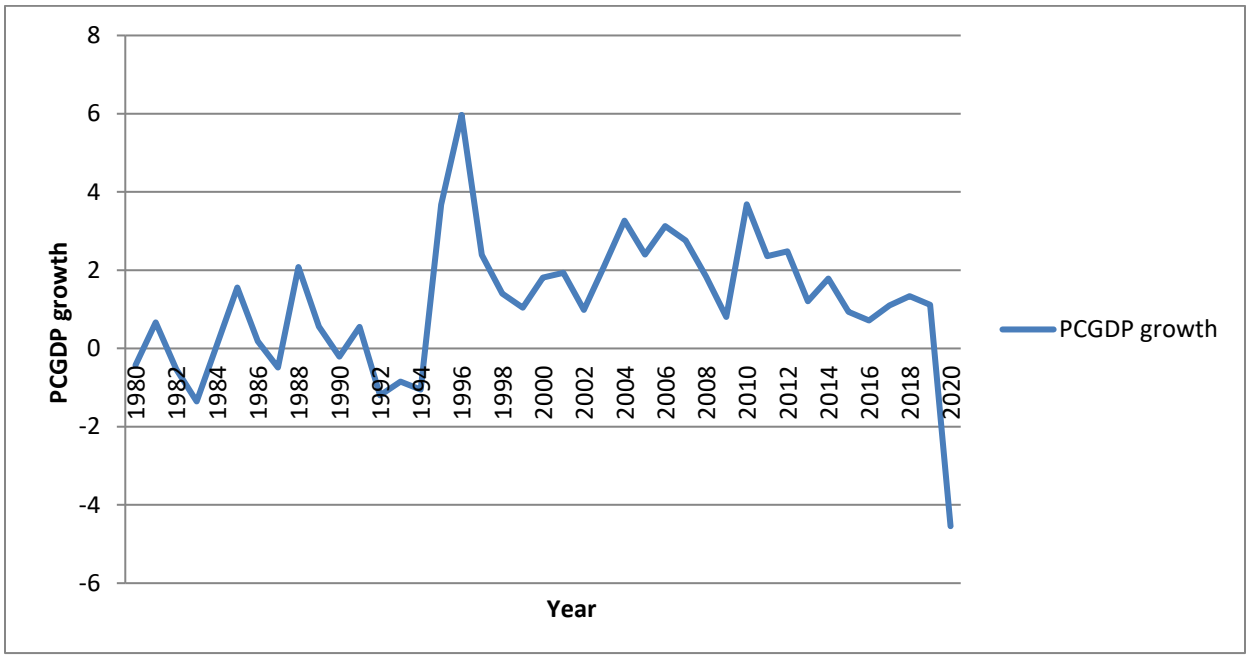
The average value of **Human Capital** is about 92 with standard deviation of about 28%. Human capital is Minimum around 17.3 for Burkina Faso in 1980. On the other side, Equatorial Guinea has the highest human capital record about 177.6 for the year 1984.

4.2. The patterns of Economic growth and Structural Change in Africa

4.2.1.Trend of economic growth

The pattern of economic growth in Africa shows a fluctuating pattern. For some of the decades between 1980-2020 economic growth was at its lowest rates while higher growth rates are registered for the other decades. Early 1980s and early 1990s is known to be a period of declining economic performance Particularly during the 1980s, the so called *the lost decade*, average Per Capita GDP was declined by 1% for the mid-1970s to the late 1980s. As it can be clearly shown from fig (4.1.), Per Capita GDP growth is very low and even negative for 1980s and early 1990s fluctuating between -2 and 2 percent on average. Poor economic performance is mainly associated with a fall in Total factor productivity. The other important reason of growth failure in the period was the adoption of price control regimes in most African countries which paved the way to expansion of corruption. These factors together with the negative global shocks in petroleum market hadaggravated the crisis. (Fosu, 2008).

Fig 4.1. Trend of per capita GDP growth



Source: World Bank, World Development Indicators database

The late 1980s began to show slight growth recoveries which could not be sustained to the early 1990s when the slow growth rate continued regardless of intensive reform efforts. For instance: annual per capita GDP growth for the period 1990-96 was -0.9%. Moreover, annual average per capita GDP growth for the mid-1980s to mid-1990s was -0.6%.GDP is growing at a lower rate because of falling TFP and political instabilities prevailing in different parts of the continent, particularly in the first-half of the 1990s. For instance, South Africa experienced an average per capita growth rate of less than 1% (even negative) between 1991-95 due to TFP reduction resulted from political uncertainty of the transition from Apartheid to majority rule, and deterioration of TOT by 3.3% per annum between 1988-92, as mentioned by Fosu (2008). The other example is Botswana, the historically star performer, experienced an annual average growth rate of 4.1% (the lowest in its historical trend) due to the deterioration in its TOT.

The mid 1990s was somewhat a turning point for the trend of per capita GDP growth.Average economic growth rate was positive and relatively higher for the period, particularly until early 2010s. Per capita GDP was growing at an average rate of 6% for the year 1996which marked the peak of economic performance for the whole period between 1980 and 2020 with an exception of 2020 when Per Capita GDP is about -4%.

The suggested source of growthis mainly the rising TFP associated with the global commodity price surge and, the implementation of the Structural Adjustment Programs (SAPs) by most of the countries (Fosu, 2008: McMillan and Harttgen, 2014). As mentioned by Fosu (2008) among these countries were Benin, Burkina Faso, Cameroon, Chad, Ethiopia, Ghana, Mali, Rwanda, and Sudan. The other source of rapid growth in the 1990s was improvement in TOT of African economies associated with the global commodity price surge. Especially since the late 1990s export booms were experienced in oil, coffee, cocoa, gold and other metals. (Mcmillan, 2014). The countries experienced poor performance due to political instability and failure to adopt credible reform including, Burundi, CAR, DRC, Cote d'Ivoire, Guinea Bissau, Seychelles, Togo and Zimbabwe.

Moreover,Africacontinued to rapidly grow in the period between 2000 and 2010. Annual average Per capita GDP was growing at a rate ranging between 2 to 4%.Africa had the second highest growth rate in the world next to East Asia such that annual growth rate of African countries was high enough to double their economic performance with in ten years. Six of the ten fastest growing economies globally are from Africa for the period between 2001 and 2010. 16 of the 38 fastest growing countries in the world in 2013 were from Africa. (World Bank, 2014)

Growth in the decade is mainly associated with increase in commodity prices. Moreover, the drivers of growth in the 2000s are said to be investment in infrastructure, increased agricultural production and expanding services in African retail, telecoms, transportation, and finance. However, Ebola, terrorism and declining commodity prices were challenges of growth and development in the first half of the 2010s. Price of most important African export commodities including: gold, iron ore, crude oil, cotton and cereal which supports the economies of most African countries was started to decline since the late 2013. The price decline is said to affect most those countries which are highly dependent on metal exports. Among these, Mauritania, Niger, Tanzania and Zambia are the most important ones.Moreover, it is those countries with the least diversified commodity which are most vulnerable to deep TOT deteriorations as a result of fall in commodity prices (Odusola, 2014).The lowest growth rate since the mid-1990s is registered for 2020 which is an exception for the period. Average Per Capita GDP growth was about -4.5% and, this ismainlyattributed to the incidence of Covid-19 pandemic. (AEO, 2020).

Fig.1in AppendixA, shows the pattern of Per Capita GDP growth at country level. The trend of economic growth shows similar pattern for almost all African countries in the period between 1980 and 2020. Moreover, Most of the countries show almost equitable Per Capita GDP growth rates. It can also be understood from the figure that Real GDP growth rate was stagnant as it shows a near constant pattern without large changes in growth rates. Some greater changes are shown for the case of Equatorial Guinea, particularly for the period 1996, when Per Capita GDP was growing at a rate of 140%, and the pattern of higher growth rate lasted to the first half of the 2000s. Rwanda on the other hand, showed a greater fall in Per Capita GDP growth by 47% in 1994.

4.2.2.The Pattern of Structural Change

This section examines the patterns of structural change in Africa for the last four decades (for the 1980s to 2020) using the trends of sectorial value added and employment shares in Agriculture, industry and services sectors. The relative value added and employment shares of the sectors are compared by using bar-graphs so as to examine the feature of structural change taking place in Africa.

4.2.2.1. The pattern of Sectorial value added shares

Fig. 4.2.Trend of Sectorial Value added shares

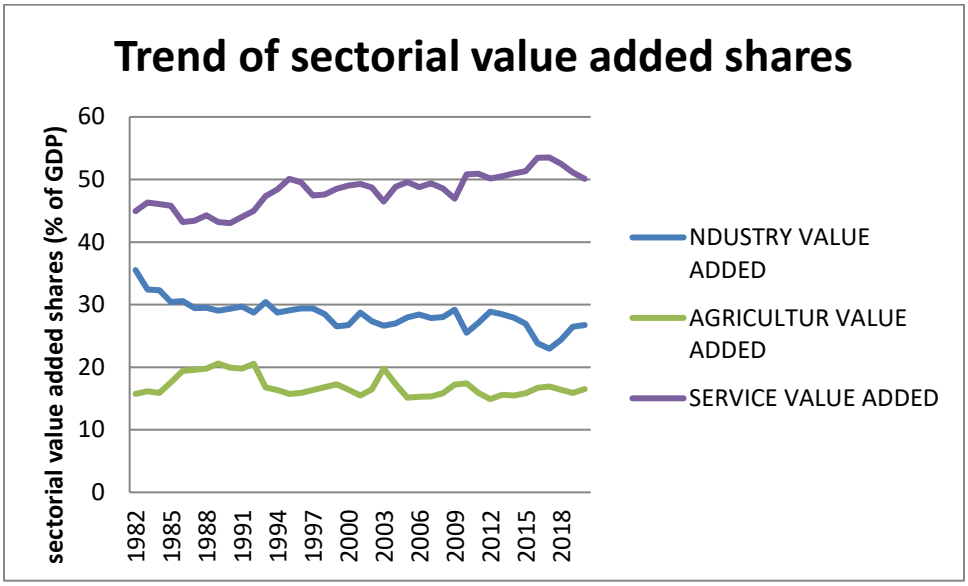
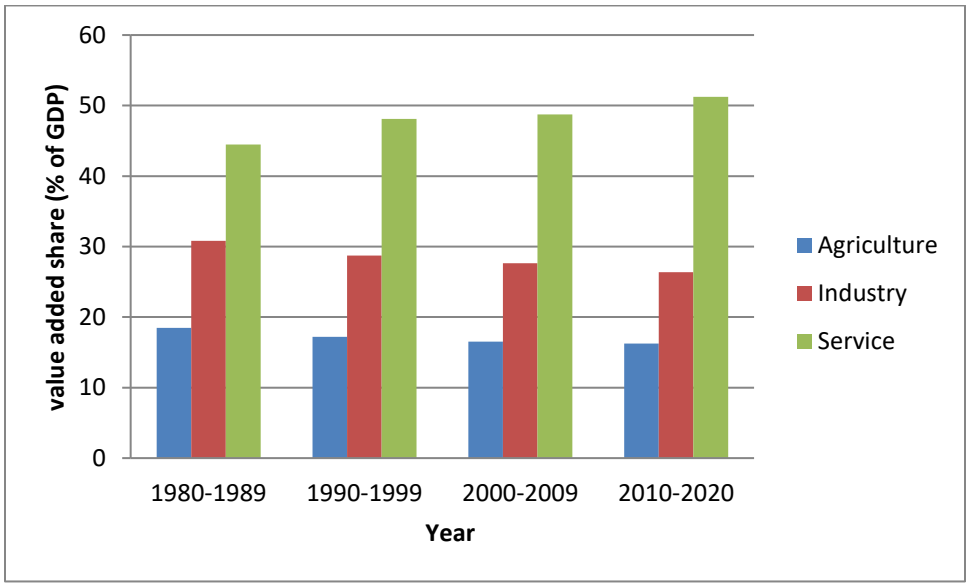


Figure (4.2) shows the trend of sectorial value added shares for the period between 1980 and 2020. Agricultural value added shows an overall slight rise fluctuating between 15 and 20% for the whole period. The sector contributes for about 16% of total value added in 1980 which was raised to 17% in 2020. The trend of sectorial value added shows that Service value added has an overall increasing pattern during the period. Moreover, it remains to be of the highest value added share for the whole period. The service sector was contributing about 45% of total value added in 1980 and, 50% of total value added in 2020.

Industrial value added, the second largest contributor, shows an overall declining pattern for the period. Industry is shown to be contributing about 36% of total value added in 1980 which is declined to 27% in 2020. The trend of industrial value added shows a fluctuating pattern as shown in figure (4.2). Moreover, IVAD doesn't show significant changes on average for the period between 1980 to 2020 as can be understood from the maximum and minimum average values of IVAD for the period. The maximum average IVAD for the countries is 27% of GDP which is recorded for 2008 and the minimum average value of less than 24% of GDP is recorded for 2016. So, it can generally be concluded that structural change during the whole period is stagnant.

However, there are some variations among different periods. The share of industrial value added in GDP is relatively low for the years before 2000 which shows the fact that the process of structural change during the period was slow. This is due to the allocation of labor from agriculture to non-business service sectorsrather than to more productive manufacturing sector, particularly for the 1990s labor was allocated from agriculture to market service industries with lower productivity growth than manufacturing sector as indicated by McMillan and Harttgen (2014) and Rodrik (2014). The share of industry value added is relatively large in the post 2000 period, particularly for 2005-2015. This is in line with the result of a study by (McMillan and Rodrik, 2011) and McMillan and Harttgen (2014) which concluded that during the post 2000 period resources are shifting from less productive agricultural sector to more productive manufacturing sector therefore, more industry value added and growth enhancing structural shift. According to the above studies, growth isaccompanied by a significant shift of labor from agriculture to the manufacturing sector (also to the service sector) even though the expansion of the Industry sector is not as much satisfactory as expected from the rapid economic growth during the period.

Fig:4.3. Comparison of value added shares among the three sectors



Source: World Bank world Development indicators database

Fig. 4.3. Presents the comparison between sectorial shares of value added among the three sectors. The service sector takes the leading share in terms of sectorial value added for the whole period under study, followed by industrial and agricultural sectors, respectively. Agricultural value added share is the lowest one and it shows a slightly declining pattern with an average share of 18% in 1980s, 17% in 1990s and 2000s, and 16% in the 2010s. Even though, the declining share of the agricultural sector in total value added has an implication of economic structural shift, the very small change indicates that the pace of structural change in Africa during the period is slow. As indicated by (Badiane, 2014), African countries experienced a slow pace of structural change which is reflected by the slower drop of agriculture's share in GDP and employment during 1980-2008.

The share of industrial sector in total value added is somewhat larger than that of agricultural sector but, it still remains smaller than that of the service sector. Moreover, the share is declining between 1980 and 2020. Industrial value added was recorded to be about 30% in the 1980s which is declined to 29%, 28% and 26% in the 1990s, 2000s and 2010s, respectively. This implies the fact defined by the concept of pre-mature de-industrialization which implies the shift of economic activities from industrial to service sector at lower levels of income as compared to the experiences of contemporary industrialized countries (Lopes, 2015). Pre-mature deindustrialization is regarded as the feature of economic transformation in most of today's developing economies.

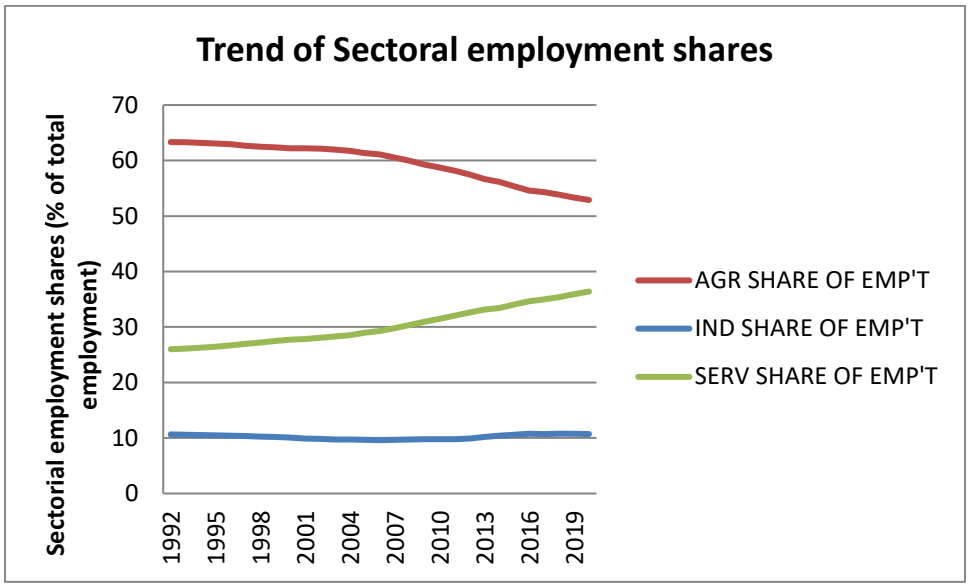
The service sector value added share is increasing for the period between 1980 and 2020, as shown in fig (4.3). Accordingly, 44% of total value added for 1980-1989 was accounted by the sector. This value was raised to 48% for 1990s and 49% for the 2000s. Expanding further, the service sector accounts for more than half of the total value added between 2010 and 2020. The highest share of the service sector is associated with the movement of more productive resources from agriculture to service sector rather than to the manufacturing sector (Timmeret.al.,2013).Moreover, shift of productive resources is directed towards the less productive non-tradable services rather than modern tradable industries. Production and productive resources were shifting to non-tradable services which lead to the absence of modern industries in most African countries. It is also the reason behind the incapability of most African economies to generate high-quality jobs as stated by (Odusola, 2014).

Fig 2 in Appendix A, shows that the trend of Industrial value added share among the countries exhibits a similar pattern to some extent and, follows a nearly constant pattern for any particular country. This implies lack of significant rises in industrial value added share of GDP. For almost all countries, Industrial share in output is not as large as required so as to say the necessary structural shift is taking place. However, there are some exceptions in relative terms. Industrial value added share is relatively higher for Algeria, Botswana, the Congo Republic, Equatorial Guinea and Gabon. Moreover, South Africa and Zambia experienced a relatively higher share of industrial output for the pre-2000 period even though the pattern began to be shifted in the post-2000.

4.2.2.2. Trend of sectorial employment shares

The other important measure of structural change is the shift in share of employment among the three major economic sectors. According to the theory and the experience of the already industrialized economies, as the economy is growing more productive resources are expected to be employed in the modern sectors (Industry and services). However, the reality of African countries is different from this fact. Based on fig (4.4.), Agricultural sector accounts for the largest employment share with a significant gap with those of the modern sectors. Moreover, the industry sector is the least employer with a very small share of total employment which is almost stagnant.

Fig. 4.4.The trend of Sectorial employment shares



Source: World Bank world Development indicators database

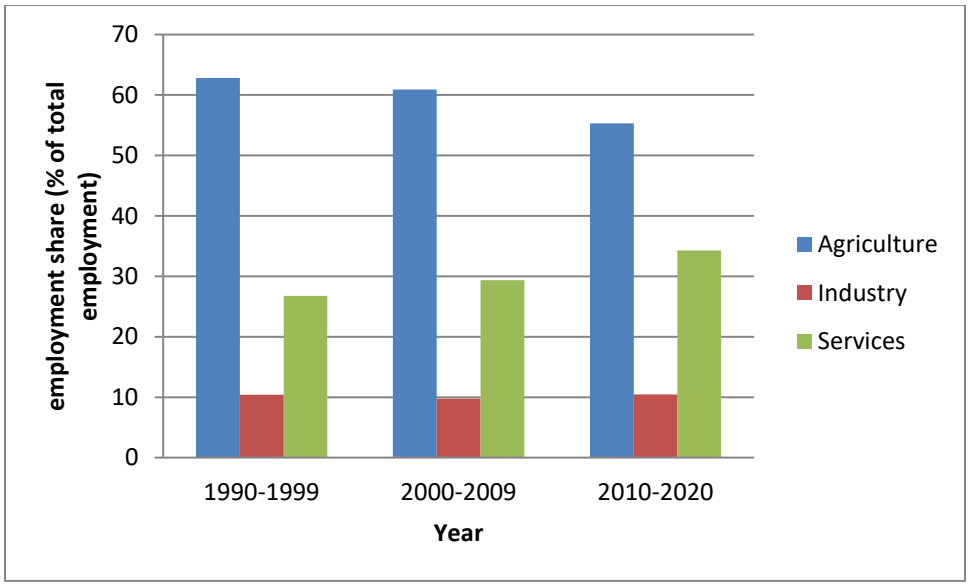
Figure (4.4) shows the trends of employment shares in the agricultural, industry and service sectors for the period between 1992 and 2020 for which sectorial employment data is available for African countries. As one can understand from the above figure employment share is declining in the agricultural sector, rising in the service sector and remained to be stagnant (almost constant) in the industry sector. Even though employment share of the agricultural sector is declining for the period it still lies higher above the shares of the two sectors (employing more than 50% of employed resources as of 2020). On the other hand, the service sector is employing an increasing share of resources but, it still lies far below that of the agricultural sector (employing less than 40% of resourcesas of 2020).The industry sectors contribution to employment is shown to be stagnant and, it is near 10% for almost the whole period.

Even though, the employment share of Industry sector is low and that of agriculture is relatively higher, it can be seen that the latter is declining during the period. Fast and significant shift of productive resources to more productive sectors is paying because of the wide productivity gap between the sectors. For example, as of 2005, Agricultural productivity was about 36% of average productivity, service sector (excluding transport) productivity around the average and, manufacturing sector productivity about two times the average productivity. Therefore, the wider

productivity gap provides large potential of growth with more reallocation of labor from low productivity agriculture to higher productive industry and service sectors.

Fig (4.5.)Comparing the three sectors, shows that 63% of total employment in the 1990s was associated with the agriculture sector which was declined to 61% in the 2000s and later to 55% for 2010-2020 remaining the largest employer of all the three sectors.The second largest employer is the service sector accounting for 48% of total employment between1990-1999 and 49% for 2000-2009. The service's employment share is raised to 51% (more than half of total employment) for 2010 to 2020. The least share of sectorial employment is accounted by the Industry sector with a stagnant share of 10% of total employment between 1990 and 2020.

Fig. 4.5. Comparison of sectorial employment shares



The service sector is shown to be of higher contribution in terms of both value added and employment sharesas compared to the industry sector.i.e., higher share of total output is associated with the service sector and, larger share of resources are shifting from agriculture to the services sector than to the industry sector.This is an illustration of the fact that Africa's structural change is following a pattern opposed to the conventional path of structural transformation experienced by contemporarily developed countries that it is bypassing the Industrial sector (Particularly, the manufacturing sector).

Moreover, as can be understood from the above result, the pattern of value added and employment shares of agriculture, industry and service sectors implies that Structural transformation in Africa is slow as compared to the rapid economic growth which was experienced since the mid-1990s. This can be understood from the fact that employment and export share of the agricultural sector remains dominant still the present day while that of industry and service sectors remains still low. This is because of the lower productivity growth in agricultural sector due to the imbalance between real value added (which is low) and employment (which is high) which hinders the contribution of the agricultural sector to faster structural change. (Anderson et.al., 2016)

4.2.3. Trend of Economic growth and Industry Value added

Fig. 4.6. A, Trend of Real GDP and Real Industry Value added during the poor-growth period (between 1980- 1995)

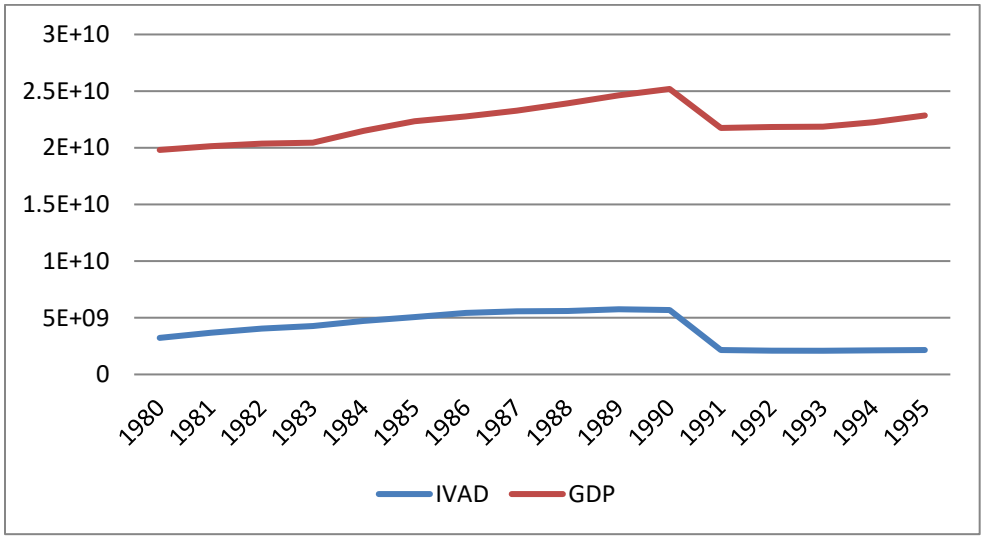
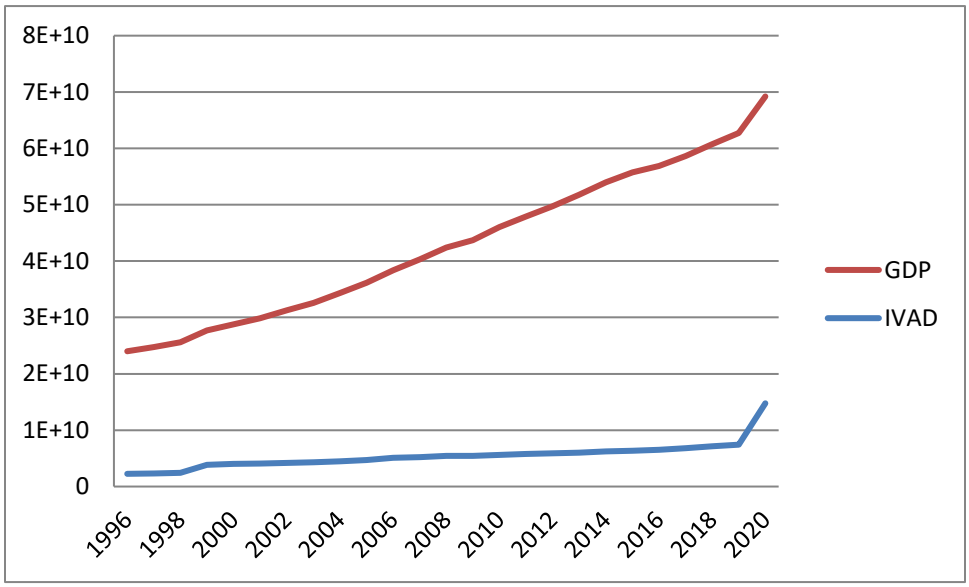


Fig 1.6B: Trend of Real GDP and Real Industry value added during high-growth periods (1996 to 2020)



The study used Real GDP and Real industry value added to examinethe relative trends of structural change and economic growth. From fig (4.6A), both real GDP and IVAD are at their lowest levelsand rising at an insignificant rate which leads to nearly constant pattern of growth in both IVAD and GDP for the whole 1980s. The economy of African countries experienced economic growth rate ranging between -2 and 2, and industry value added is also rising at a smaller rate for the period. The trend continued in the 1990s being worsened particularly for the years 1990 and 91 both Real GDP and IVAD shows a declining pattern which is mainly associated with failure in factor productivity and the timely imposed control regimes in most of African countries. Moreover, the global shock in the petroleum market affected sectorial and overall economic activities in the economies (Fosu, 2008). The remaining years of the first half of the 1990s showed a constant pattern of growth.

IVAD continued to show a stagnant pattern until the late 1990s, particularly for 1998. The late 1990's marked a period of rising performance in both GDP and IVAD, even though, IVAD is rising with a much less rate than GDP. The good performance during the period is associated with the adoption of structural adjustment programs (SAPs) by most of African economiesand, the resulting productivity growth. The resulting favorable environment for trade facilitated

industrial expansion and increased overall output. Moreover, privatization, as an element of the SAPs motivated economic activities, so as to bring about faster economic growth. (Fosu, 2008)

The 2000s and 2010s are periods of faster economic growth and expanding industrial output. Both IVAD and real GDP rise for the two decades. Some variation is shown for the late 2010s where IVAD showed a sharp rise in the late 2010s, specifically, 2019 and 2020

The expansion of industry value added in the 2000s and 2010s is particularly associated with the increased chinese investment in African manufacturing in the decades. The manufacturing investment, output and trade is rising significantly for most of African countries, as indicated by the study performed for 34 sub-Saharan African countries. The other important reason behind the expansion of industry value added in the period after 2000 is the expansion of industrial parks in the continent. A large number of European, Chinese, American and Middle East companies are looking to invest on industrial parks in Africa. As a result, there are some countries which become outstandingly beneficiaries from these investments in industrial firms: among these are Ethiopia and Kenya, in East Africa. Even though, efficiencies of these investments differ between countries, the continent as a whole is benefiting from the employment opportunities and economic growth. (AFDB, 2014).

On the other hand,Real GDP declines in 2019 and 2020, which is mainly due the negative economic effect of Covid-19 Pandemic (AEO, 2020).

Studying figure (4.6 A & B), one can conclude that Industrial value added, representing structural change and, Economic growth have a nearly similar pattern for the period under study, except for 2019 and 2020. That means, the Industry sector is performing well when economic performance is good and, vice versa. Similarly, the economy's output is higher when industrial performance is good. This implies that, there is a potential of mutual growth in the sectorial and overall level or Industrial growth and economic growth are input for each other and results of each other. In the same way, poor economic performance contributes to poor industrial growth which is also true for the reverse.

4.3. Result of Econometric Analysis

The econometric model is estimatedby employing the Pooled OLS, Fixed Effects (FE) and Random Effects (RE) estimation techniques of panel data. The appropriate model for estimation is selected by employing the Breusch-pagan LM test (to choose between pooled ols and random effects) and Hausman's specification test (to choose between Fixed effect or random effects.

Table 4.2. Results of Pooled OLS, Fixed Effects (FE) and Random Effects model (RE).

Variable	RE		FE		OLS	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
PCGDPgrowth	0.0633	0.026**	0.0651	0.023**	-0.1259	0.034**
LHK	2.3107	0.000***	2.3156	0.000***	3.3236	0.000***
LEXR	-0.1186	0.001***	-0.1188	0.001***	-0.1185	0.067*
Landpercapita	-0.0054	0.985	0.0035	0.991	-0.9489	0.108
Geo (Coastal)	1.5028	0.687	0(omitted)		0.4796	0.474
Openness	10.7806	0.000***	10.7769	0.000***	17.7942	0.000***
Constant	7.7107	0.062*	9.7055	0.001***	1.1005	0.783

Table 4.2.shows the various estimates of the parameters in the Pooled OLS, Fixed effects and Random effects cases. The coefficients for the pooled OLS estimates are far different from those of the fixed and random estimates whereas the coefficients for the fixed and random estimations seem to be similar for almost all of the variables. Standard tests are employed so as to choose among the three models. Among the tests the study used the BP LM test for random effects and the Hausmann specification test. The result of the BP LM test shows that the random effects model is appropriate compared to the pooled OLS, and the preceding Hausmann test showed that the fixed effect is consistent.

Table 4.3.Result of Breusch and Pagan Lagrangian multiplier test and Hausman specification test for random effects.

	Chi-square	**p-value**
Ho: Var (u)=0	**11268.03**	**0.0000**
Ho: difference in coefficients not systematic	**12.68**	**0.0484**

The null hypothesis of the BP LM test which assumes the individual random effect to be constant across individuals (Var (u)=0), is rejected because the p-value of the test is less than 0.05. This implies that the individual random effect is significant and each country in the data has different error variance. According to this result the RE is appropriate model than the pooled OLS. Therefore, the next step is to choose between FE and RE models using the Hausmann specification test.

The null hypothesis of the Hausmann specification test assumes no difference between employing the fixed and random models (difference in coefficients not systematic) which means no correlation between the explanatory variables and the individual effect. The null is rejected as the p-value of the test is less than 0.05. This result implies that there is systematic difference between the coefficients of the fixed and random models which implies the existence of correlation of the individual heterogeneity with one or more of the explanatory variables. Accordingly, RE is not consistent whereas the FE model is consistent.

Based on the result of the BP and hausmann tests the FE model is selected as the consistent model to estimate the data than the pooled OLS and the Random Effects model. However, the only satisfied assumption for the fixed effects model is the assumption of strictly exogenous explanatory variables while the model failed to satisfy the requirements of homosckedastic, non-auto-correlated and cross-sectional independent error term for the fixed effects model. Moreover, the Gaussian assumption of no perfect collinearity (Gujarati, 2009) is satisfied for the variables in the model(See the results in appendix B:6,7,8,9 and 10)

Based on the model diagnosis test the best model to estimate the data is the Fixed Generalized Least Squares (FGLS) model because it addresses the problems of hetterosckedasticity,

autocorrelation and cross-sectional dependence in the idiosyncratic error term (Bai, 2019). The Result for the Fixed GLS model is presented in table 4.2., and interpreted as follows.

Table 4.4. Estimation result for the FGLS Model

Variable	Coefficient	Standard errors	p-value
PCGDP growth	-0.1260	0.0592	0.033**
LHK	3.3236	0.9147	0.000***
LEXR	-0.1185	0.0645	0.066*
Land-per-capita	-0.9489	0.5888	0.107
Geo (Coastal)	0.4797	0.6674	0.472
Openness	17.7943	0.9999	0.000***
Constant	1.1005	3.9918	0.783
Wald chi-square	418.72		0.0000***

Note: ***, ** and * indicates significance of the respective variables at 1%, 5% and 10% levels of significance, respectively.

Source: Own estimation Using Stata 14

The variables exchange rate, human capital, openness and Per Capita GDP growth are significant as shown in table 4.2 among whichhuman capital and trade openness have a positive relationship with Industrial value added whereas the relationship between exchange rate and Per capita GDP growth with Industrial value added is negative. On the other hand, Land per capita and Geography variables are insignificant.

Accordingly, the coefficient for **per capita GDP growth** is negative and significant at 5% level as opposed to the prior expectation implying that per capita GDP growth has a significant negative effect on Industrial value added. According to the result, a 1% rise in Per capita GDP growth results in a 12.6% drop in industry value added share.

This result is opposed to the prior expectation of positive relationship between economic growthand structural change. However, it supports the descriptive analysis which shows a declining pattern of Industry value added in the last four decades. Even for those decades,

particularly for the2000s and 2010s for which the economy grows at a faster rate (Fosu, 2008), value added share of the industry sector is falling (WB, 2022).

Moreover, the declining trend of industry value added implies de-industrialization as the share of the Industry sector in the economy is declining leaving part of more contribution for one of the other sectors, the service sector in this case. This implies the fact defined by the concept of pre-mature de-industrialization which implies the shift of economic activities from industrial to service sector at lower levels of income as compared to the experiences of contemporary industrialized countries (Lopes, 2015) and it is concluded to be the feature of economic transformation in most of today's developing economies. According to the World Bank (WB, 2022) data, it is the service sector expanding in terms of value added share in African economies. For all the past decades service sector has the highest sectorial share of value added, and its share is increasing for the whole period. Grabowski (2015) stated that economic growth in Sub-Saharan Africa is characterized by de-industrialization. According to the study, the industrial share of value added is rising for the period between 1960 and 1990 which includes the lost periods of Africa (mid-1975 to mid-1990s) when economic growth is declining. In the same manner, the period of rapid economic growth is coincided with a declining value added share of the industry sector in the last two decades, 2000s and 2010s.

The coefficient for **Human Capital** variable is significant at 1% level and, it has a positive effect on Industry value added as expected. The result supports the resource endowment hypothesis that states a large pool of human capital is beneficial for structural change in Africa.The coefficient of human capital implies that any improvement in human capital by 1%,rises the share of industry value added by more than 3%.

The result implies the more potential for industrialization as more improved is Human capital in Africa. The result indicates that the more educated the labor force is the improved capacity of involving in the more knowledge requiring modern manufacturing sector which is backed by the shift of production to the manufacturing sector and thereby boosting the Industrial value added of the economies. This result is consistent with the one undertaken by Pinto, et.al., (2020) analyzing the role of human capital for structural change using data for the period 1950-2013 for a group 40 countries from the world, 13 from Africa. The result of the study shows that human capital has a significant positive effect on the development or expansion of the industry sector

(manufacturing and construction). The same kind of relationship is found by McMillan and Harttgen (2014) studying structural transformation for a group of countries among which 19 are from Africa. Finding a positive relationship between human capital and structural change, the study concluded that given a larger initial share of agriculture in employment and, higher productivity in the manufacturing and service sectors, increase in educated labor force is followed by an intensive and productivity enhancing shift of labor from agricultural to manufacturing and service sectors. The results of these studies are consistent with the theoretical basis that states the positive role of human capital for structural change that more educated labor is important in the production of more sophisticated industrial products and adoption of new technology.Regarding this, Anyanwu (2017) analyzing the key drivers of manufacturing value added in North Africa for the period 1990-2014 found that human capital has a significant positive effect on manufacturing value added. The study emphasized that more educated labor is an important input for the production of more sophisticated manufactures. Bye (2021) also found a significant positive role of human capital in bringing about structural change by improving innovative and absorptive capacities of the working force.

Exchange rate has a negative significant relationship with Industrial value added as indicated by its coefficientwhich is significant at 1% level as opposed to the prior expectation. The regression result shows that any rise in exchange rate by 1% results in a drop of the industrial value added share by about 12%. This result doesn't support the hypothesis that states competitive/devalued exchange rate is an important factor in facilitating for structural change in Africa.

However, this result is consistent with the failure faced by African countries in the 1990s due to higher devaluations coupled with other factors which led to the contraction of the manufacturing sector (Signe, 2018). Even though the theoretical perspective puts the important role of exchange rate devaluation in promoting manufacturing and industrial sector, devaluation may also pose a negative effect on the expansion of the manufacturing sector due to one of the following reasons. Exchange rate devaluation discourages imports by increasing the cost of imported goods on which production of the continents' manufacturing firms highly relies and, leads to the contraction of manufactured output. The increased cost of production due to devaluation also reduces the capacity of domestic firms to compete with foreign firms whose products are imported (Mujidat and Akinola, 2016) Moreover, currency devaluation may act negatively with

industrial development through the external debt service which rises and crowds out domestic investment as the currency is devalued more and more (Morely, 1992).

There are also empirical findings that show negative relationship of exchange rate depreciation and the expansion of the industrial/manufacturing sector.Among these is the study by Mlambo (2020) analyzing the relationship between exchange rate policy and manufacturing performance in SACU (South African Customs Union) states. The result of the study indicatesa negative relationship between exchange rate and manufacturing performance i.e., exchange rate depreciation is associated with declining manufacturing performance. This result implies a negative relationship of exchange rate depreciation and the expansion of more productive manufacturing sector. The same negative relationship is obtained byMujidat and Akinola (2016) and Falaye, et.al.,(2019) for the case of Nigeria where currency devaluation poses a negative effect on manufacturing performance. This is associated with the reduced competitiveness of domestic firms due to higher prices of domestic products as compared to those of imported goods. The higher price is the result of high cost of production due to depreciation.

The coefficient of **Openness** is positive and significant at 1% level, and this is in line with the prior expectation. A 1% rise in the share of foreign trade in GDP leads to an expansion of Industry value added share by about 18%.

Expansion of foreign trade in African countries (expansion of the share of export and import) in GDP has shown to be associated with the expansion of the manufacturing sector thereby contributing to structural shift of the economy towards the industry sector. More imports mean more inputs to the manufacturing sector and, there by more manufactured output. In the same way, more exports mean more market for and more gain from manufactured outputs. This pattern results in increased manufacturing value added and increased manufactured exports. The positive role of trade openness for the expansion of the industrial sector in North Africa is also discovered by Anyanwu (2017). According to the study trade openness paves the way to growth of the manufacturing sector and the whole economy. Moreover, the study conducted by Umoh and Effiong(2013) analyzes the effect of trade openness on manufacturing performance for the case of Nigeria, and found that there is a significant positive relationship between trade openness and manufacturing performance. Trade openness has also a positive role in industrial performance of SADC countries as indicated by Khobai and Moyo (2021).

The constant that indicates the average intercept of all groups hasaninsignificant coefficient value of 1.1005.

The Wald-test for the model shows a Chi-square value of 418.7 which is significant.This shows the set of variables in the model are collectively significant.

4.4. Result of Causality test

The null hypothesis of no causality is rejected for both directions that there is significant bidirectional causality between structural change and economic growth. Accordingly, the result of the granger causality test shows that Structural change granger causes economic growth and, economic growth granger causes structural change.

Table 4.5.Result of Causality test

Null Hypothesis	F-Statistic	P-value
PCGDPgrowth doesn't Granger Cause IVAD	6.18049	0.0021
IVAD does not Granger Cause PCGDP_GROWTH	3.81638	0.0222

Own computation using E-views 9

The result is consistent with the theoretical basis and empirical facts. Theories emphasize that Structural change and economic growth are highly interrelated economic phenomena that act as both an input and output to each other,i.e., structural change is an important driver of economic growth that changes in sectorial shares of employment, output and nature of production bring about overall productivity growth (Kuznets, 1957).Kaldor (1966) cited the role of industrial expansion in bringing about faster economic growth and assuring economic development. The more the share of the industry sector in value added, faster is the rate of economic growth. On the other hand, productivity growth in different sectors leads to further structural transformation, i.e., productivity increase in the agricultural sector facilitates expansion of the industrial sector and, the growth of the later leads to further development of the agricultural sector and expansion of the service sector due to the respective shift of demand (Clark, 1940).

Moreover, Matsuyama (2008) put the two-way causality between economic growth and structural change as economic growth drives changes in the output and employment compositions of the economy which in turn drives economic growth. More importantly Matsuyama pointed the circular causality between economic growth and structural change implying that lack of productivity growth and lack of structural change reinforce each other leaving an economy in to a vicious circle of poverty. This is consistent with the case of African economies particularly for the period before the mid-1990s when growth began to be accelerated. In the meantime, productivitygrowth was low and failed to bring about efficient structural change which in turn leads to low per capita income level due to lesser expansion of more productive modern sectors.

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATIONS

5.1. CONCLUSION

Structural change and economic growth are two sides of the same coin. Sustainable economic growth cannot be realized without structural change in the economy which implies the allocation of resources from traditional agriculture to modern industry and Service sectors. In the same way, Structural change requires an increase in overall and sectorial productivity. Rise in productivity of the traditional sector facilitates the output contribution of the modern sector through the shift of demand and more supply of inputs for the manufacturing sector. Moreover, the pattern of structural change is highly affected by the level of income as higher per capita income is associated with a relatively a smaller share of the agricultural sector andlarger share of Industry and service sectors, respectively.

Empirical findings imply that Structural change in Africa and other developing countries is following an unusual path different from the one followed by contemporary developed countries when they were at the same level of income. African economies are moving from agriculture dominated to service dominated ones, bypassing the manufacturing (Industry) dominated stage of structural change. The present study, aimed at analyzing the role of economic growth in facilitating structural change in Africa and, analyzing the driversbehind the structural change of African countries. The study also examined the two-way causality between economic growth and structural change for the case of Africa.

According to the result of this study economic growth, human capital, exchange rate and openness are significant determinants of structural change in Africa. Structural change has a negative relationship with economic growth and exchange rate (depreciation or devaluation) whereas it is positively related to human capital and trade openness.The study also found that being Coastal or landlocked is of no significant effect on the process of structural change. Moreover, natural capital is insignificant in driving structural change in Africa. Moreover, the study proved the bidirectional causality between structural change and economic growth.

Economic growth has a negative significant effect on Industry value added in Africa. The faster economic growth since the mid-1990s is characterized by declining share of industry value added. This is in line with those conclusions given about Africa's and other developing countries'pattern of structural change as de-industrializing pre-maturely. With declining role of the industry sector, the service sector is dominating African economies' structural change particularly, for the fast growth periods since the mid-1990s. This implies that, most part of the national income is invested on productions of the service sector rather than expanding the industrial sector.

Educated labor force is important for the expansion of the industrial sector and a resulting structural change to take place in Africa. According to the result of the study, the positive role of primary education is significant in bringing about a significant shift of output towards the industry sector. As more educated labor is involving in the industry sector which requires more skill, there is an improved capability of adapting to new technology, and contributing to new innovation with the expansion of primary education. Adaptation and innovation being the keys to expanded industrial production, improved human capital is contributing to more value added share of the industry sector.

Trade openness has a significant positive role in expanding industrial output share in African countries. For the fact that African countries are dependent on imported inputs for the bulk of their industrial production, more open economies provide more access toimported inputs, therefore increased industrial output share. On the other hand, there is an expanded volume of exports of industrial (particularly manufactured) products in open economies which other than contributing for increased manufactured export share, also contributes to more income (in terms of foreign currency) of the industrial sector and, more industrial value added. Therefore, trade openness is an important positive player of structural change in African economies.

Exchange rate depreciation is found to have a negative significant effect on the share of industry value added. Even though not compatible with the theoretical basis and prior expectations, the coefficient of exchange rate variable exhibits a negative sign.This might be due to the rising cost of imported inputs for themanufacturing sector due to depreciated currencies which leads to rising cost of production. Raised cost of production leads either to less production or higher prices which leads to lower growth and incompetetiveness of the domestic manufacturing sector,

respectively. Moreover, foreign debt burden, the common problem of African economies, is exacerbated with devalued exchange rates as debts are paid in foreign currencies.

POLICY RECOMMENDATION

Based on the findings of the study, policies in favor of expanding economic growth, improving human capital stock and making the economy more open and engaging in the international market, are important to bring about successful structural change in African economies.

The implication of a negative relationship between structural change and economic growth is that large part the growing national income in African countries is invested on the expansion of the service sector. Therefore, policies aimed at expanding the industrial sector should be designed and implemented so as to raise the role of the industry sector in the economies. Moreover, the governments of African countries should employ more effort to encourage the expansion of domestic manufacturing industries so as to make the industry sector able to grow and dominate the other sectors of the economy. Thereby, Africa begins to re-industrialize.

More educated labor as one of an important driver of industrial growth and structural change has to be injected in to the economy by investing in human capital. Investments in primary education should be expanded so as to improve the available stock of human capital which is at its lowest stage in Africa. This is because, human capital being represented by more educated labor, haveimmense contribution in bringing about successful structural change thatexpansion of modern sectors requires the employment of more skilled labor.

More Trade liberalizing policies should be designedso as to reap the positive benefits of extensive foreign trade flows. An increased volume of trade means moreexportsof and more import to an economy. Increased import facilitates more industrial, particularly manufacturing production therefore policies aimed at minimizing protections (in terms of tariff or quota) have to be designed. This enables import of more inputs for the industrial sector production thereby expanding the sectors' output. Larger volume of exports resulting from liberalized economies, on the other hand, increases the income of manufacturing firms thereby expanding the sector.

Exchange rate policies should be well managed to minimize the effect of larger devaluations which leads to higher cost of production and the resulting effect of incompetetiveness with

higher prices and/or lower output. Moreover, maintaining less volatile exchange rate system reduces the risk of uncertainty and facilitates manufacturing investment thereby expanding the industrial sector.

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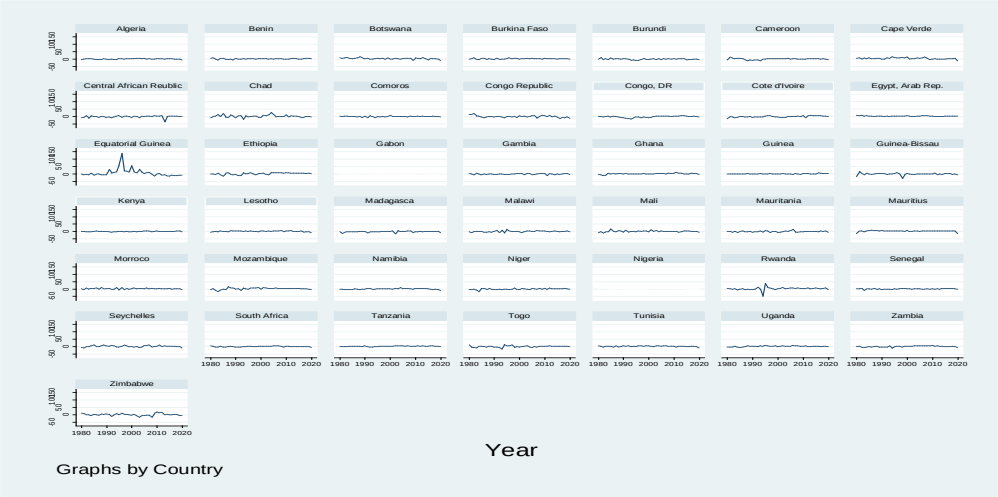
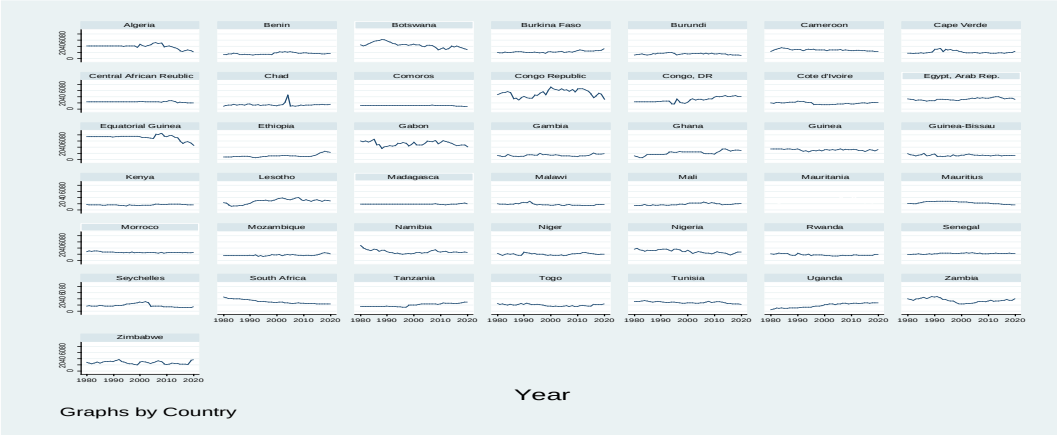
Appendices

Appendix A: Fig (1) The trend of PCGDP growth by country



Source: own computation using Stata 14

Fig (2) Trend of IVAD by country



Source: own computation using Stata 14

Appendix B: Estimation results

1. Estimation result of Pooled OLS Model

```
. reg IVAD PCGDPgrowth landpercapita LEXR LHK oppeness FDI Geo1
```

Source	SS	df	MS	Number of obs	=	1,339
				F(7, 1331)	=	62.90
Model	46351.0799	7	6621.58284	Prob > F	=	0.0000
Residual	140121.357	1,331	105.275249	R-squared	=	0.2486
				Adj R-squared	=	0.2446
Total	186472.437	1,338	139.366545	Root MSE	=	10.26

IVAD	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
PCGDPgrowth	-.134496	.0590539	-2.28	0.023	-.2503448	-.0186471
landpercapita	-1.010987	.5867477	-1.72	0.085	-2.162038	.1400641
LEXR	-.0936945	.0645291	-1.45	0.147	-.2202844	.0328953
LHK	3.589087	.9133209	3.93	0.000	1.797382	5.380793
oppeness	17.63459	.9968101	17.69	0.000	15.6791	19.59008
FDI	-.0038593	.0009014	-4.28	0.000	-.0056276	-.002091
Geo1	.5152482	.6648548	0.77	0.438	-.7890294	1.819526
_cons	.1402744	3.982871	0.04	0.972	-7.673114	7.953663

2. Estimation result of Random Effects Model

```
. xtreg IVAD PCGDPgrowth landpercapita LEXR LHK oppeness FDI Geo1

Random-effects GLS regression                   Number of obs     =      1,339
Group variable: c_id                            Number of groups  =         42

R-sq:                                           Obs per group:
     within  = 0.1469                                         min =          1
     between = 0.0878                                         avg =       31.9
     overall = 0.2320                                         max =         41

                                                Wald chi2(7)      =     226.77
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000
```

IVAD	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
PCGDPgrowth	.0640987	.0285185	2.25	0.025	.0082035	.119994
landpercapita	-.0066889	.2993569	-0.02	0.982	-.5934176	.5800399
LEXR	-.1130192	.0353273	-3.20	0.001	-.1822593	-.043779
LHK	2.406495	.635885	3.78	0.000	1.160183	3.652807
oppeness	10.99273	.8941087	12.29	0.000	9.240304	12.74515
FDI	-.0011086	.0006818	-1.63	0.104	-.0024448	.0002277
Geo1	1.474099	3.720241	0.40	0.692	-5.817439	8.765636
_cons	7.197265	4.136417	1.74	0.082	-.9099625	15.30449
sigma_u	11.03934					
sigma_e	4.7362724					
rho	.84454342	(fraction of variance due to u_i)				

3. Estimation result of Fixed Effects Model

```
. xtreg IVAD PCGDPgrowth landpercapita LEXR LHK oppeness FDI Geo1, fe
note: Geo1 omitted because of collinearity

Fixed-effects (within) regression               Number of obs     =      1,339
Group variable: c_id                            Number of groups  =         42

R-sq:                                           Obs per group:
     within  = 0.1469                                         min =          1
     between = 0.0837                                         avg =       31.9
     overall = 0.2337                                         max =         41

                                                F(6,1291)         =      37.04
corr(u_i, Xb)  = 0.2165                         Prob > F          =     0.0000
```

IVAD	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
PCGDPgrowth	.0659293	.0285254	2.31	0.021	.009968	.1218906
landpercapita	.0025176	.2996312	0.01	0.993	-.5852999	.5903351
LEXR	-.1133129	.0353722	-3.20	0.001	-.1827061	-.0439197
LHK	2.408912	.6380888	3.78	0.000	1.157107	3.660717
oppeness	10.99174	.9050742	12.14	0.000	9.216163	12.76732
FDI	-.0010846	.0006846	-1.58	0.113	-.0024278	.0002585
Geo1	0	(omitted)				
_cons	9.201974	2.819101	3.26	0.001	3.671452	14.7325
sigma_u	11.164649					
sigma_e	4.7362724					
rho	.8474842	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(41, 1291) = 120.93                     Prob > F = 0.0000
```

4. Test for random effect

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        IVAD[c_id,t] = Xb + u[c_id] + e[c_id,t]

        Estimated results:
                     |       Var     sd = sqrt(Var)
             ---------+------------------------------
                IVAD |    139.3665       11.80536
                   e |    22.43228       4.736272
                   u |     121.867       11.03934

        Test:   Var(u) = 0
                                 chibar2(01) = 11268.03
                              Prob > chibar2 =   0.0000
```

Hausmann's test Result

```
. hausman fe re
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
PCGDPgrowth	.0659293	.0640987	.0018306	.0006286
landpercap~a	.0025176	-.0066889	.0092064	.0128192
LEXR	-.1133129	-.1130192	-.0002937	.0017813
LHK	2.408912	2.406495	.0024169	.0529867
oppeness	10.99174	10.99273	-.0009842	.1404592
FDI	-.0010846	-.0011086	.000024	.0000627

```
                b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       12.68
                Prob>chi2 =      0.0484
```

6. Endogenity Test Result

```
      gress 2sls IVAD PCGDPgrowth LEXR LHK oppeness Geo1 (landpercapita = L_PCGDPgrowth L_landpercap

trumental variables (2SLS) regression          Number of obs   =      1,297
                                               Wald chi2(6)    =     420.20
                                               Prob > chi2     =     0.0000
                                               R-squared       =     0.2456
                                               Root MSE        =     10.191

------------------------------------------------------------------------------
        IVAD |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
landpercapita |  -.8820589   .8056587    -1.09   0.274    -2.461121    .6970031
  PCGDPgrowth |  -.1262781   .0602367    -2.10   0.036    -.2443399   -.0082163
         LEXR |  -.1178915    .065262    -1.81   0.071    -.2458026    .0100196
          LHK |   3.130409    .941024     3.33   0.001     1.286036    4.974782
     oppeness |   18.24829   1.017673    17.93   0.000     16.25368    20.24289
        Geo1 |   .4781197   .6721486     0.71   0.477    -.8392674    1.795507
       _cons |   1.689989   4.136289     0.41   0.683    -6.416988    9.796966
------------------------------------------------------------------------------
Instrumented:  landpercapita
Instruments:   PCGDPgrowth LEXR LHK oppeness Geo1 L_PCGDPgrowth
               L_landpercapita L_LEXR L_LHK L_oppeness

. estat endog, forceweights forcenonrobust

  Tests of endogeneity
  Ho: variables are exogenous

  Durbin (score) chi2(1)          =  .143741  (p = 0.7046)
  Wu-Hausman F(1,1289)            =  .142871  (p = 0.7055)

. ivregress 2sls IVAD PCGDPgrowth landpercapita  LHK oppeness Geo1 (LEXR = L_PCGDPgrowth L_landperc

Instrumental variables (2SLS) regression       Number of obs   =      1,297
                                               Wald chi2(6)    =     422.51
                                               Prob > chi2     =     0.0000
                                               R-squared       =     0.2457
                                               Root MSE        =      10.19

------------------------------------------------------------------------------
        IVAD |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        LEXR |  -.1253738   .0694035    -1.81   0.071    -.2614022    .0106546
  PCGDPgrowth |  -.1285296   .0600317    -2.14   0.032    -.2461895   -.0108697
landpercapita |  -1.093175   .5847973    -1.87   0.062    -2.239357    .0530067
         LHK |   3.095633   .9355882     3.31   0.001     1.261914    4.929352
     oppeness |   18.27653   1.014388    18.02   0.000     16.28837    20.26469
        Geo1 |   .4485259   .6713507     0.67   0.504    -.8672973    1.764349
       _cons |   1.943088    4.09095     0.47   0.635    -6.075026    9.961202
------------------------------------------------------------------------------
Instrumented:  LEXR
Instruments:   PCGDPgrowth landpercapita LHK oppeness Geo1 L_PCGDPgrowth
               L_landpercapita L_LEXR L_LHK L_oppeness

. estat endog, forceweights forcenonrobust

  Tests of endogeneity
  Ho: variables are exogenous

  Durbin (score) chi2(1)          =   .09022  (p = 0.7639)
  Wu-Hausman F(1,1289)            =   .08967  (p = 0.7646)

. ivregress 2sls IVAD PCGDPgrowth landpercapita LEXR  oppeness Geo1 (LHK = L_PCGDPgrowth L_landperc

Instrumental variables (2SLS) regression       Number of obs   =      1,297
                                               Wald chi2(6)    =     423.27
                                               Prob > chi2     =     0.0000
                                               R-squared       =     0.2457
                                               Root MSE        =      10.19

------------------------------------------------------------------------------
        IVAD |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         LHK |   3.240808   .9486558     3.42   0.001     1.381477    5.100139
  PCGDPgrowth |  -.1287989    .060025    -2.15   0.032    -.2464458   -.011152
landpercapita |   -1.08151   .5848984    -1.85   0.064    -2.227889     .06487
        LEXR |  -.1186426   .0652528    -1.82   0.069    -.2465358    .0092506
     oppeness |   18.24197   1.015118    17.97   0.000     16.25237    20.23156
        Geo1 |   .4379373   .6707336     0.65   0.514    -.8766763    1.752551
       _cons |   1.285208   4.145535     0.31   0.757    -6.839891    9.410308
------------------------------------------------------------------------------
Instrumented:  LHK
Instruments:   PCGDPgrowth landpercapita LEXR oppeness Geo1 L_PCGDPgrowth
               L_landpercapita L_LEXR L_LHK L_oppeness

. estat endog, forceweights forcenonrobust

  Tests of endogeneity
  Ho: variables are exogenous

  Durbin (score) chi2(1)          =  .894433  (p = 0.3443)
  Wu-Hausman F(1,1289)            =  .889529  (p = 0.3458)

. ivregress 2sls IVAD PCGDPgrowth landpercapita LEXR  LHK Geo1 (oppeness= L_PCGDPgrowth L_landpercap

Instrumental variables (2SLS) regression       Number of obs   =      1,297
                                               Wald chi2(6)    =     420.28
                                               Prob > chi2     =     0.0000
                                               R-squared       =     0.2456
                                               Root MSE        =     10.191

------------------------------------------------------------------------------
        IVAD |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     oppeness |   18.68344   1.040372    17.96   0.000     16.64434    20.72253
  PCGDPgrowth |  -.1294779   .0600292    -2.16   0.031     -.247133   -.0118228
landpercapita |  -1.111933   .5849297    -1.90   0.057    -2.258374    .0345082
        LEXR |  -.117635    .065256    -1.80   0.071    -.2455345    .0102644
         LHK |   3.130409    .941024     3.33   0.001     1.286036    4.974782
        Geo1 |   .4781197   .6721486     0.71   0.477    -.8392674    1.795507
       _cons |   1.689989   4.136289     0.41   0.683    -6.416988    9.796966
------------------------------------------------------------------------------
Instrumented:  oppeness
Instruments:   PCGDPgrowth landpercapita LEXR LHK Geo1 L_PCGDPgrowth
               L_landpercapita L_LEXR L_LHK L_oppeness

. estat endog, forceweights forcenonrobust

  Tests of endogeneity
  Ho: variables are exogenous

  Durbin (score) chi2(1)          =  .143741  (p = 0.7046)
  Wu-Hausman F(1,1289)            =  .142871  (p = 0.7055)
```

```
. ivregress 2sls IVAD landpercapita LEXR LHK oppeness  Geo1 (PCGDPgrowth = Lag_PCGDPgrowth Lag_landpercapita Lag_LEXR Lag_LHK Lag_
> oppeness)

Instrumental variables (2SLS) regression          Number of obs   =      1,297
                                                  Wald chi2(6)    =     411.59
                                                  Prob > chi2     =     0.0000
                                                  R-squared       =     0.2268
                                                  Root MSE        =     10.317

------------------------------------------------------------------------------
        IVAD |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 PCGDPgrowth |   -.470618    .239877    -1.96   0.050    -.9407683   -.0004677
landpercapita|  -1.388771    .6252701   -2.22   0.026    -2.614278   -.1632643
        LEXR |  -.1373223    .0673143   -2.04   0.041     -.269256   -.0053887
         LHK |   3.429408    .9743804    3.52   0.000     1.519658    5.339159
    oppeness |   18.58956    1.048302   17.73   0.000     16.53492    20.64419
        Geo1 |   .0052794    .7452615    0.01   0.994    -1.455406    1.465965
       _cons |    1.02801    4.185492    0.25   0.806    -7.175404    9.231424
------------------------------------------------------------------------------

. estat endog, forceweights forcenonrobust

  Tests of endogeneity
  Ho: variables are exogenous

  Durbin (score) chi2(1)          =  2.23213  (p = 0.1352)
  Wu-Hausman F(1,1289)            =  2.22218  (p = 0.1363)
```

6. Heterosckedasticity test

```
. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (42)  =   19277.09
Prob>chi2 =      0.0000
```

7. The Joint LM test for random effects and serial-correlation

```
Breusch and Pagan Lagrangian multiplier test for random effects

        IVAD[c_id,t] = Xb + u[c_id] + e[c_id,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+------------------------------
                    IVAD |   139.3665       11.80536
                       e |   22.45849       4.739039
                       u |   122.0785       11.04891

        Test:   Var(u) = 0
                            chibar2(01) = 11530.62
                          Prob > chibar2 =   0.0000
```

8. Cross-sectional dependence test

```
Average correlation coefficients & Pesaran (2004) CD test

Variables series tested: IVAD PCGDPgrowth landpercapita LEXR LHK Geo1
                                 Group variable: c_id
                               Number of groups: 43
                        Average # of observations: 41.98
                                      Panel is: unbalanced
```

Variable	CD-test	p-value	corr	abs(corr)
IVAD	-0.42	0.674	-0.002	0.336
PCGDPgrowth	20.85	0.000	0.108	0.171
landpercap~a	111.83	0.000	0.581	0.679
LEXR	-2.20	0.028	-0.011	0.399
LHK	42.93	0.000	0.223	0.496
Geo1	.	.	.	.

9. TestofPerfectCollinearity

```
. vif, uncentered
```

Variable	VIF	1/VIF
LHK	6.50	0.153925
oppeness	5.35	0.186960
LEXR	1.72	0.580734
landpercap~a	1.35	0.742052
PCGDPgrowth	1.06	0.947495
Mean VIF	3.19	