Asian Journal of Economic Modelling
ISSN(e): 2312-3656
ISSN(p): 2313-2884
DOI: 10.18488/journal.8.2018.64.476.500
Vol. 6, No. 4, 476-500

URL: www.aessweb.com

ACCOUNTING FOR THE RISING VALUE ADDED IN SERVICES COMPARED TO THAT IN AGRICULTURE IN AFRICAN ECONOMIES

John C Anyanwu[1+]
Joanna C Anyanwu[2]

[1]*Lead Research Economist, Macroeconomic Policy, Forecasting & Research Department, African Development Bank, Rue Joseph Anoma, 01 BP 1387 Abidjan, Cote d'Ivoire*
Email: J.ANYANWU@afdb.org
[2]*Woodrow Wilson School of Public & International Affairs, Princeton University, Princeton, New Jersey 08544, USA*

(+ Corresponding author)

Article History
Received: 1 June 2018
Revised: 6 August 2018
Accepted: 10 September 2018
Published: 25 October 2018

Keywords
Services value added
Agriculture value added
Manufacturing value added
Structural transformation
Structural change
Key drivers
Africa.

JEL Classification:
N50; N70; O13; O14; O55; O57.

ABSTRACT

Structural transformation has been a central feature of economic development, marked by sectoral shifts over time. The literature predicts shifts of output and labor first from agriculture to manufacturing, followed by manufacturing to services at later stages of development. This pattern is consistent with the experience of advanced economies that have experienced secular declines in manufacturing employment and sectoral value added since the 1970s. It is also consistent with the experience of East Asian economies whose striking growth performance in recent years has been underpinned by dynamism in manufacturing. However, the recent relatively high-growth episode in many African economies has been accompanied by a declining share of agriculture and rising services share, while the manufacturing sector's share of output has not only remained low but also declining. This paper investigates the key factors accounting for the rising value added in services compared to that in agriculture in Africa between 1990 and 2011, during which the continent experienced a relatively high economic growth. Using the OLS and IV-SLS regression methods, we find that value added in services and agriculture are accounted differentially by the level of economic development (quartic relationships), other macroeconomic factors, different levels of education, natural resources, different forms of globalization (economic, social and political), domestic credit, population size, ICT, and availability of arable land. We conclude with policy implications.

Contribution/ Originality: This study is the first to investigate the key factors accounting for the rising value added in services compared to the slow declining that in agriculture in Africa. It uses the most recent data to present new, interesting stylized facts. It empirically assesses the key factors accounting for these developments.

1. INTRODUCTION

Structural transformation has been a central feature of economic development, marked by sectoral shifts (among the sectoral trichotomy of agriculture (primary sector), industry (especially manufacturing) (secondary sector), and services (tertiary sector) over time. The literature predicts shifts of output and labor first from agriculture to manufacturing, followed by manufacturing to services at later stages of development. This pattern is consistent with the experience of advanced economies that have experienced secular declines in manufacturing employment and sectoral value added since the 1970s. It is also consistent with the experience of East Asian economies whose striking growth performance in recent years has been underpinned by dynamism in manufacturing. However, the recent relatively high-growth episodes in many African economies has been

accompanied by a declining share of agriculture and rise in services share, while the manufacturing sector's share of output has not only remained low but also declining.

What are the main driving forces behind rising services value added vis-à-vis agriculture value added in Africa? Answering this has important implications. In particular, understanding the role played by each of those drivers is essential to ensure the appropriate policy response. In addition, those drivers have important implications regarding growth perspectives in line with the alarming hypothesis of de-industrialization as the principal factor responsible for inferior economic performance in the Western countries, which some economists believe to be the onset of a "secular stagnation" or growth slow down (Baumol, 1967; Szirmai, 2012; Rodrik, 2016). Then what should be the development strategy of African countries already characterized by relatively high degree of tertiarisation? All these fascinating questions deserve empirical investigation. This paper therefore investigates the key factors accounting for the rising value added in services compared to that in agriculture in Africa between 1990 and 2011, during which the continent experienced a relatively high economic growth.

In particular, this paper extends and contributes to the literature in four ways. Firstly, we document stylized facts on recent agriculture and service value added development globally and in Africa. Secondly, the paper empirically assesses the Kuznets' effect with respect to agriculture and service value added as a percentage of Gross Domestic Product (GDP) in the continent. Thirdly, we empirically investigate the key factors accounting for the rising value added in services compared to that in agriculture in Africa between 1990 and 2011, during which the continent experienced a relatively high economic growth. Unlike many previous studies we employ a third and fourth degree polynomials of economic development and second degree polynomials of the indicator(s) of education, in recognition of their recent stated theoretical and empirical relationships with sectoral shares of output (Haraguchi and Rezonja, 2011a;2011b; United Nations Industrial Development Organization (UNIDO), 2015; Haraguchi, 2016). Fourthly, we offer policy suggestions in light of the evidence that would help African countries to formulate and implement policies as well as effectively tackle other problems hindering value added development in these sectors while addressing the apparent problem of "premature de-industrialization". To the best of our knowledge, the comprehensiveness of this study is, to date, unmatched in Africa in terms of focus, the scope of databases sourced and the range of variables covered.

The remainder of the paper is organized as follows. Section II discusses key stylized facts. Section III presents a brief review of the theoretical framework and empirical literature, while Section IV dwells on the model and data. The empirical results are presented and discussed in Section V while Section VI concludes with policy implications.

2. STYLIZED FACTS

This section presents some recent stylized facts on sectoral value added shares. Figure 1 shows demonstrates the empirical regularity observed in developed countries, whereby agriculture value added has not only been falling but remains very low – 9% in 1970 and falling to about 4% in 2016. While manufacturing value added maintained a gradual decline (from 26% in 1970 to 17% in 2016), services value added had made tremendous and continues leap globally, from 53% in 1970 to about 68% in 2016.

Table 1 presents data on value-added shares of agriculture, industry, manufacturing (which is also included in industry), and services in GDP for 29 developing economies. From there, we can take a few illustrative examples to characterize the industrialization trends in the last six decades. Indeed, according to UNCTAD Virtual Institute (2016) in 1950, Argentina, Brazil, and other Latin American economies, together with some African countries such as South Africa and Morocco, were among the most industrialized economies in the developing world. Their shares of manufacturing in GDP were higher than in economies such as the Republic of Korea, for example. It was posited that by 1980, most of these economies had further expanded their manufacturing industries, and were joined by other economies such as the Tanzania and Zambia. However, by 2005, the situation had changed dramatically such

that most of these economies that had become more industrialized between 1950 and 1980 had gone back to the industrialization levels of the 1950s. – that is, to say, deindustrialized. It was the services sector that benefited from this process, with its share in value added growing from 45% to 67% South Africa, and from 45% to 64% in Brazil. Also, for a group of 16 selected advanced economies, their manufacturing share stood at 31% in 1950, falling to 30% in 1960 and further to 24% in 1980 and then to just 17% in 2005. On the other hand, their services share rose from 43% in 1950 to 48% in 196- before going up to 59% in 1980 and 70% by 2005.

Thus, a clear evidence of global "de-industrialization" or "tertiarisation" is illustrated in Figure 1. As the Figure shows, services are currently the largest sector in many economies. It is no wonder that this dynamic structural change process has raised the question of whether services can be a source of sustained growth since for a long time the services sector was seen as unproductive, merely functioning as a complement to other sectors and traditionally viewed as composed of low productivity/stagnant activities, so that increased specialization towards services would lead to a growth slowdown (Baumol, 1967). Some other observers have recently suggested that services are taking over the role of manufacturing and becoming the new engine of economic growth.

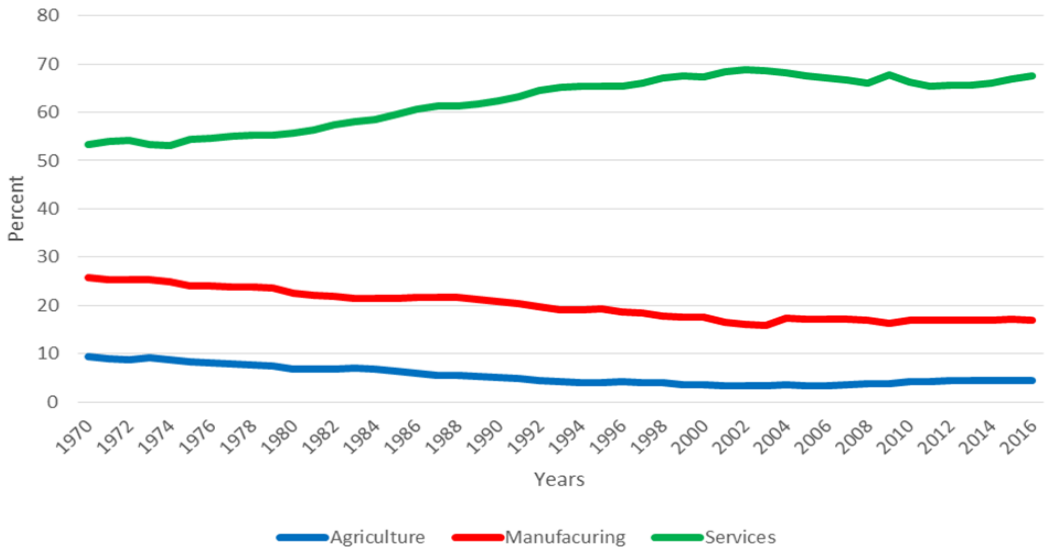

Figure-1. Global Trend in the Sectoral Value Added Shares (% of GDP), 1970-2016

Source: Authors, using UNCTADStat Data.

The global averages shown in Figure 1 mask the structural differences between developed and developing continents such as Africa. In Figure 2, while the pattern and directions of the sectoral shares in Africa mirror those of developed countries, it noteworthy that for developed counties, agricultural share is the least. For Africa, manufacturing share is the least and seems to have been stagnant hence some authors insist that Africa has never been industrialized, at least not in the conventional sense (Jalava, 2006). Some others call Africa's case "premature de-industrialization" rather than just "de-industrialization". Thus, Africa is a case of structural change without industrialization as agriculture's decline was matched by an increase in services (the dominant sector), with manufacturing remaining low, marginal and stagnant throughout the period. Others view Africa's case as that of "negative de-industrialization". In fact, Rowthorn and Wells (1987) distinguish between two types of deindustrialization: "positive de-industrialization", which occurs in developed economies as a natural result of sustained economic growth, and "negative de-industrialization", which occurs at all income levels as in Africa. With respect to positive de-industrialization (result of industrial dynamism), fast productivity growth in manufacturing allows firms to satisfy demand using less labor (in other words, productivity growth reduces employment) while output expands – "a sign of economic success". Here, displaced workers find employment in the services sector because, as incomes rise, demand patterns shift towards services, also due to Engel's law. Negative de-

industrialization, on the other hand, occurs when a country has a poor economic performance or when its manufacturing industry faces challenges hence falling manufacturing output, or higher productivity in manufacturing, creates unemployment, thereby depressing incomes - "a product of economic failure" (Rowthorn and Wells, 1987; Rowthorn, 1994; UNCTAD, 1995; UNCTAD Virtual Institute, 2016). Thus, Africa, characterized by a very large share of the service sector at early stages of development has followed the traditional linear sequence of a shift from agriculture to manufacturing, followed by a shift from manufacturing to services.

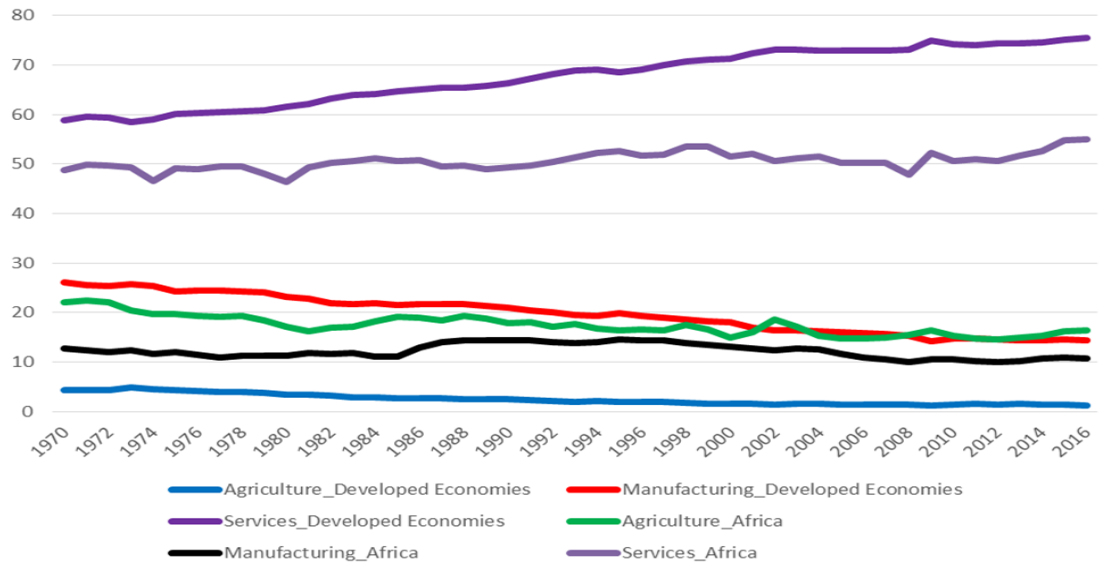

Figure-2. Trend in the Sectoral Value Added Share (% of GDP), 1970-2016 Developed Economies Africa
Source: Authors, using UNCTADStat Data

As Figure 3 demonstrates, value-added in the agriculture in all the regions has decreased significantly during the last three and half decades, with the lowest fall in Africa, and overtaking developing Asia since 1987. In fact, Africa still has the largest agriculture value added share among the regions, from 22% in 1970 to about 17% in 2016. Also mirroring the picture in Figure 2, we see that agriculture value added is lowest in the developed Americas and Europe.

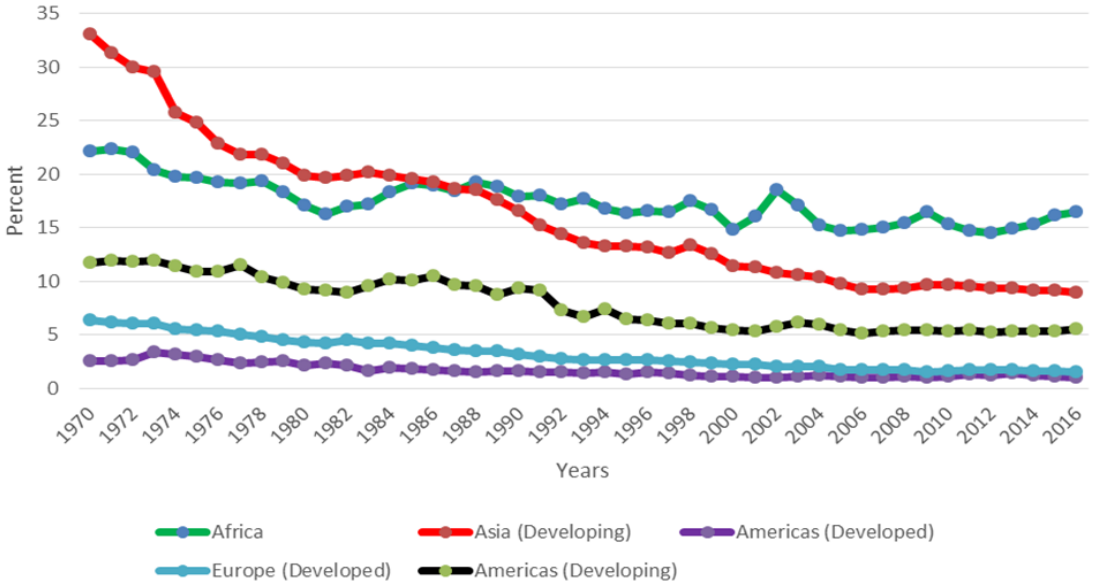

Figure-3. Selected Comparative Regional Trend in Agriculture Value Added (% of GDP), 1970-2016
Source: Authors, using UNCTADStat Data.

In terms of the manufacturing sector, Figure 4 shows that while there has been a general decline in manufacturing value added in other regions, developing Asia made a general increase with some fall between 1998 and 2003 due to the then Asian financial crisis but made a quantum leap ("leap-frogging" as it is often called) particularly from 2004 and maintained the highest share since then. Indeed, Asia is the only developing region that maintained a strong manufacturing industry over recent decades while by contrast, developing Americas and Africa present the most dramatic premature de-industrialization processes. Unfortunately, Africa's share, which is the least, seems to have stagnated – it was just about 13% in 1970 and by 2016 it has fallen to below 11%. The analyses here show that while in developing Asian economies' shares of manufacturing in value added consistently increased over recent decades, developing Americas and in particular, African countries embarked on a premature de-industrialization process similar to those experienced by developed economies.

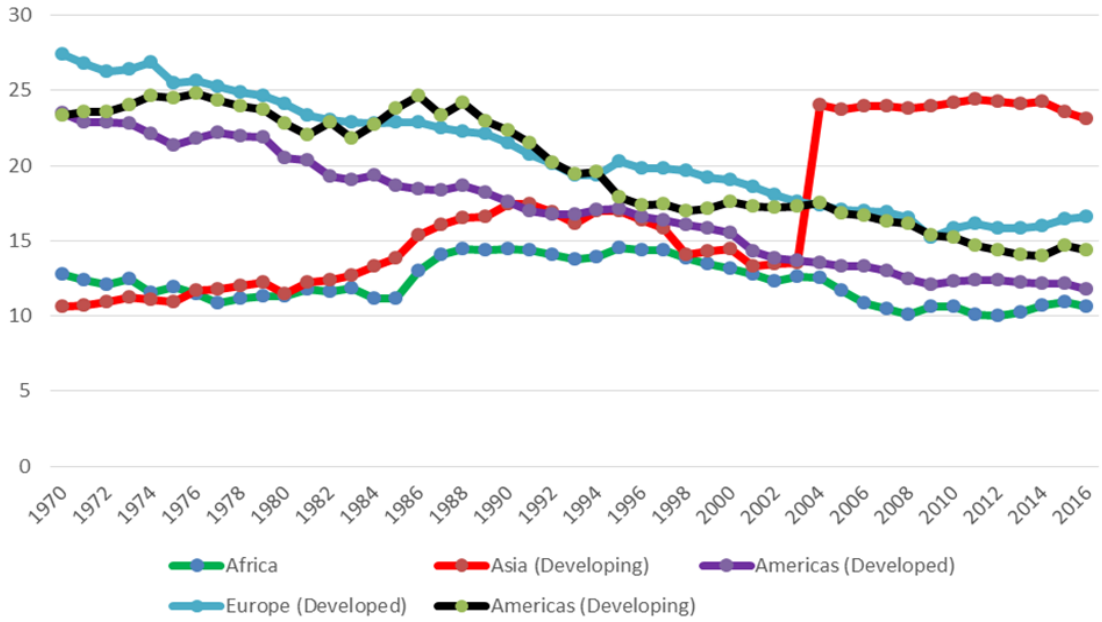

Figure-4. Selected Comparative Regional Trend in Manufacturing Value Added (% of GDP), 1970-2016

Source: Authors, using UNCTADStat Data.

Figure 5 shows that there had been a general upward trend in services value added, with developed Americas (reaching about 79% in 2016 from 65% in 1970) and then developed Europe (reaching about 73% in 2016 from about 53% in 1970). Africa (standing at about 49% in 1970 and 54% in 2016) led developing Asia until 2002 and they seemed to have converged since then.

Figure 6 presents the course of premature de-industrialization in Africa for the period, 1970 to 2016. It can be observed that manufacturing value added had not only been very low (in fact least of the three sectoral shares in GDP) but also exhibited a continuous decline from 2000, following some marginal expansion three decades earlier. In historical terms, agriculture and manufacturing value added was replaced by services value added. Agriculture value added maintained continuous decline, albeit gradual, over the past four and half decades while services maintained a continuous rise over the decades, safe for the 2000-2009 period when there was a slight fall.

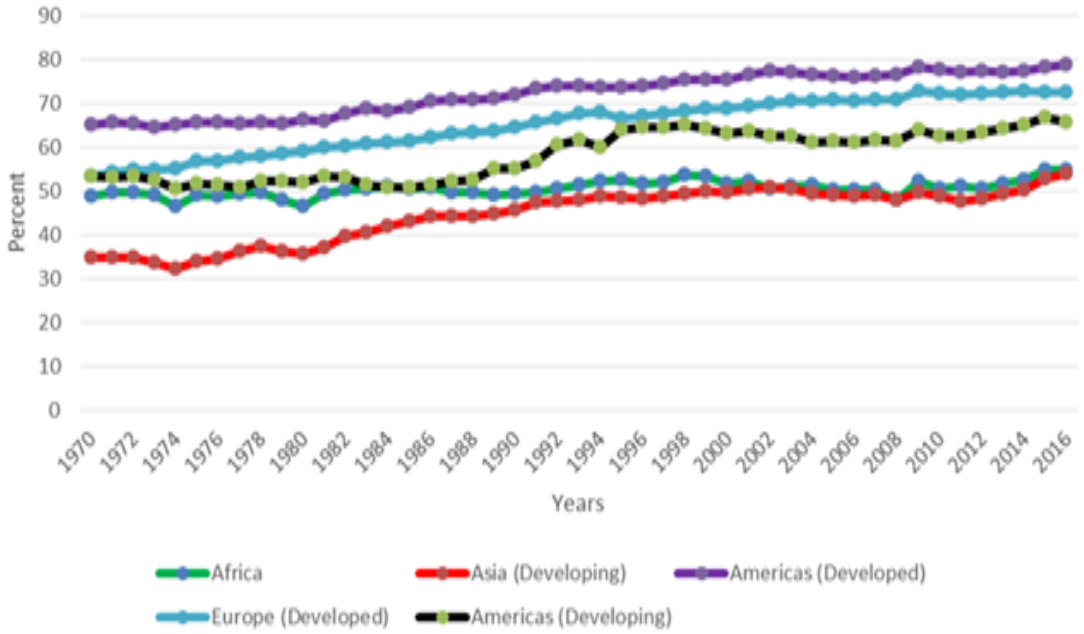

Figure-5. Selected Comparative Regional Trend in Service Value Added (% of GDP), 1970-2016
Source: Authors, using UNCTADStat Data

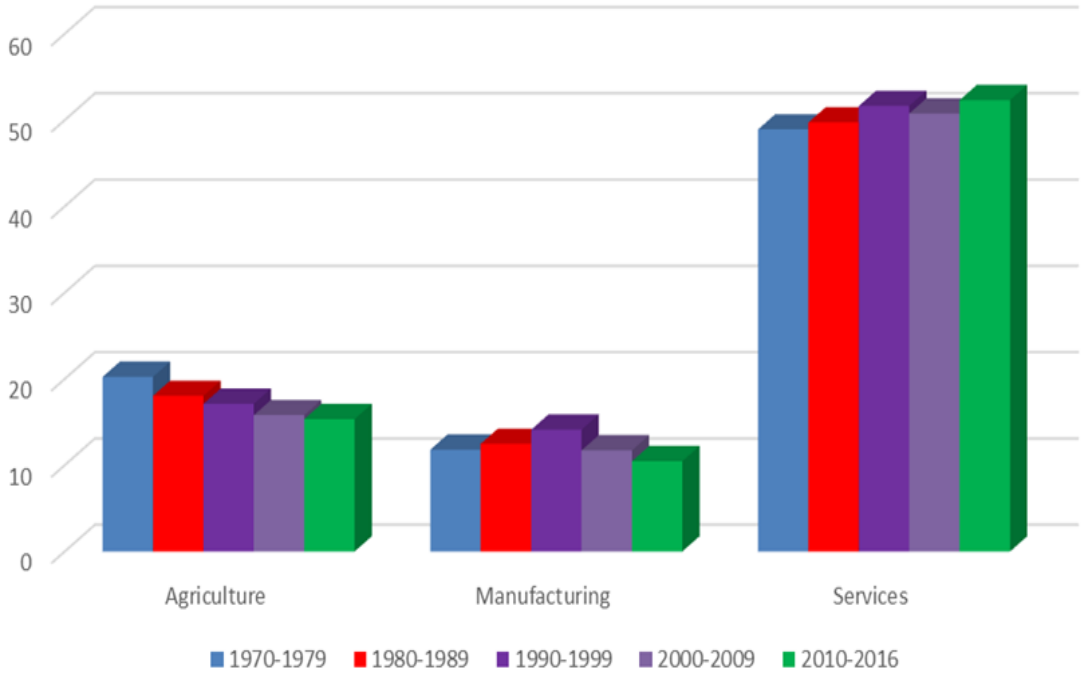

Figure-6. Africa: Decadal Sectoral Shares of Value Added (% of GDP), 1970-2016
Source: Authors, using UNCTADStat Data

3. A BRIEF THEORETICAL FRAMEWORK AND THE REVIEW OF THE LITERATURE

This section provides a brief theoretical and empirical literature on the key drivers of services and agriculture value added. The theoretical literature is couched in the context of the structural change among the sectoral trichotomy of agriculture, industry (especially manufacturing), and services. Theoretically, the principal view relate to the following channels or mechanisms: secular or incomes effect view or a variant of the Engel effect, the Cambridge view, the Baumol effect, the Dutch-disease view, and the Bacon-Eltis view, changes in relative (sectoral) prices, changes in input-output linkages, and changes in comparative advantage via globalization and international trade.

According to the *secular trend* or *income effects* view (the secular path resulting from the stages of development, typically in the industrialized world), structural change is a manifestation of the attempt on the part of society to reallocate available resources in response to changing tastes and income. As income rises above subsistence level, the proportion of income spent on goods with high agriculture (primary) commodity content declines. At this stage, both industry (especially manufacturing) (secondary) and services (tertiary) sectors grow mainly at the cost of the agriculture (primary) sector see Ansari (1994). The income effects view is akin to Engel (1857) whereby as per capita incomes rise, the share of agricultural expenditures in total expenditures declines and the share of expenditures on manufactured goods increases. That is, the lower the per capita income of a country, the larger the proportion of that income that will be spent on basic agricultural foodstuffs – and per capita income increases, the demand for agricultural products will decline and the demand for industrial products will tend to increase. As incomes rise, agriculture sheds labor due to the low income elasticity of demand for agricultural goods.

Thus, countries specializing in agricultural/primary production will not profit from expanding world markets for manufacturing goods. The *Kuznet's effect* had indeed stated that, structural change during the growth process is characterized by the massive shift of labor out of agriculture into manufacturing and services in the early stages of economic development, and away from manufacturing towards services in later stages of economic development. Thus, as income level further rises, the services sector grows at the cost of the manufacturing sector, because the agriculture sector has already reached a certain minimum (Chenery, 1961; Fels *et al*., 1971; Kasper, 1978). The secular trend or income effects view leaves very little room for policy as the economy moves from one equilibrium to another without a loss of efficiency.

The resulting de-industrialization is seen by the *Cambridge view* as due to a growing inability of the export sector to pay for rising imports (Cornwall, 1977; Singh, 1977; Thirlwall, 1978; Ansari, 1994) stemming from a slow growth in demand for manufactured goods domestically and internationally. The resulting balance of payments constraint leads to cut down in output to match growth in exports hence the manufacturing sector declines under pressure. In terms of policy, the Cambridge view suggests innovation in output and technology in order to enhance competitiveness in international markets.

A variant of this is the *Baumol effect* or *"cost disease"* effect where by economic resources, in particular labor, move from the dynamic or "progressive" sectors, those characterized by a relatively high rate of technical progress, to the stagnant or "non-progressive" sectors, or those characterized by a relatively low rate of technical progress (Baumol, 1967). Essentially, the process of reallocation of activity across sectors is attributed to changes in relative sectoral prices, driven by sectoral differences in technology. Here, relatively faster productivity growth in agriculture pushes agriculture workers to produce complementary non-agriculture goods.

There is also the *Dutch Disease effect* (Bruno and Sachs, 1982; Corden and Neary, 1984) which explains structural change in terms of *resource movement* and *spending effects* and posits that a rise in volume and prices of exporting commodities (natural resources), generate an affluence (abundance) of foreign currency, which in turn leads to an evident and persistent appreciation of the real exchange rate. The *spending effect* arises from a rapid increase in real income following the natural resource/price boom, creating an excess demand for services, which leads to a further real appreciation and causes an additional shift of resources away from the manufacturing sector. Indeed, this Dutch Disease tends to generate four effects: contraction of the manufacturing sector, due to the direct (natural resources) and indirect (expansion of non-tradable service-based goods) deindustrialization; persistent exchange rate appreciation; wage increase (another form of revaluation), and expansion of natural resources and non-tradable service-based goods, as a replacement for tradable manufactured goods.

The other theoretical view relates to *different capital intensities in production* whereby agricultural production is more conducive to rapid capital deepening, which in turn pulls labor into the more labor intensive non-agriculture sector. Subsequent analysts have tried to introduce elements into these received theories. For example, Kongsamut

et al. (2001) introduce non-homothetic preferences, which lead to differential income elasticities of demand across sectors; Ngai and Pissarides (2007) allow for differences in sectoral productivity growth rates, and Acemoglu and Guerrieri (2008) allow for differences in sectoral factor intensities, which lead to differential capital deepening across sectors (Neuss, 2017).

The *Bacon-Eltis hypothesis* sees structural change as the outcome of rapid expansion of the public sector (Bacon and Eltis, 1978; Nelson *et al.*, 1980). As government expenditure tends to be biased in favor of services, there has been a shift of resources away from the industrial (manufacturing) sector to the services sector (Ansari, 1994).

In a recent survey by Neuss (2017) two the additional channels identified include changes in input-output linkages and changes in comparative advantage via globalization and international trade in structural change. The *input-output (sectoral) linkages* take explicit account that firms offering final goods and services are in turn "consumers" of intermediate goods (Pasinetti, 1981; Fixler and Siegel, 1999; Jones, 2013; Berlingieri, 2014). Consequently, changes in the composition of intermediates, i.e. changes in the input-output linkages, have the potential to dramatically affect the allocation of labor and output across sectors and structural change. It has been noted that the main driver of the mechanism is improved technology (Information and Communication Technologies (ICT)) and as in the Schumpeterian sense, successive waves of technological breakthroughs, each of which "revolutionizing" the economic structure from within, and modifying the sectoral composition of production as part of a process of "creative destruction" characterized by the disappearance of old activities and the emergence of new modern ones (Neuss, 2017).

On the other hand, *comparative advantage via globalization and international trade view* posits that there are dynamic effects of trade on structural change. In essence, a country's economic structure is directly affected by the specialization patterns induced by trade (Rowthorn and Wells, 1987; Imbs *et al.*, 2012) which has the potential to boost productivity, especially in the sectors exposed to foreign competition, and to foster income growth. This affects the sectoral expenditures shares and, hence, the economic structure through the classical channels of the income and substitution (relative price) effects. These effects have been amplified by growing globalization and accompanying offshoring and explosion of global value chains (GVCs).

As indicated earlier, there had been extensive documentation of movement in economic activity from agriculture into industry and then from industry into services. Though countries differ markedly in terms of their compositions of economic activity at any point in time, the composition in each country is closely linked to its level of development.

According to Kuznets (1953) the share of services (excluding transport services) in national product did not vary significantly with per capita income. In the same vein, Chenery (1960) concluded that the relationship between services and per capita income is not uniform across countries. However, Chenery and Syrquin (1975) regressed the service-sector share of output on per capita income and per capita income squared and concluded that the relationship was concave to the origin – that it rose with per capita incomes but at a decelerating rate. For primary production (essentially food), the relationship is U-shaped. Contrarily, Kongsamut *et al.* (1999) found, that the share of services in output to is linear in per capita income.

Chan and Park (1989) in a cross-country study conclude that the relationship between agriculture and service value added share and per capita income is quadratic (concave to the origin), each with negative leading coefficient.

Buera and Kaboski (2009) find the relationship between the share of services in GDP and log per capita income to be linear as those for majority of individual European Union (EU15) services (European Commission, 2009a). Results by Eichengreen and Gupta (2009) support the hypothesis of a quartic relationship (with positive leading coefficient) between services share in GDP and log per capita GDP for a group of developed and developing countries and the period, 1950 and 2005. This relationship holds separately for the 1951-1969, 1970-1989, and 1990-2005 sub-periods. They identify two waves of service sector growth, a first wave in countries with relatively

low levels of per capita GDP and a second wave in countries with higher per capita incomes. In a panel regression of 103 countries for the period, 1970-2007, Herrendorf *et al.* (2013) find cubic polynomial effect of per capita GDP on both agriculture and service value added, with positive leading coefficients.

Bah (2011) in his study of nine developed countries for the period 1870 to 2000, finds that the relationship between agricultural output share and log of GDP per capita is best fitted by a U-shaped quadratic polynomial. On the other hand, the relationship between services output share and log of GDP per capita is best fitted by a third-degree polynomial, with positive leading coefficient. For 52 developing countries for the period 1965–2000, he finds no significant relationship between both agricultural and services value added shares and economic development. On further disaggregation, he finds a negative linear relationship for selected 16 African countries. Selected Asian and Latin American countries were different. For both of these two regions, agriculture value added has U-shaped relationship with economic development while services value added has a third-degree polynomial relationship with economic development, with positive leading coefficient.

Sposi (2015) in a panel of 108 countries from 1970-2011, find that there is a very strong negative relationship between agriculture's share and the level of economic development while there is a positive relationship between the share of services and the level of development.

Dabla-Norris *et al.* (2013) using data on real value added by sector of economic activity (agriculture, manufacturing and services) for a panel of 168 countries over the period 1970-2010 in their combined policy and institutional factors conclude that there is a U-shaped relationship between agriculture value added and economic development while there is an inverted U-shaped relationship between services value added and economic development. In addition, agriculture value added is positively and significantly associated with land area and negatively associated with by tertiary education enrolment ratio, mining output share, population size, age dependency ratio (young), domestic credit to the private sector, and trade openness. Services value added is positively associated with by age dependency ratio (young and old) and arable land but negatively associated with FDI in non-resource countries, mining output share, land area, and population size.

Ansari (1994) using quarterly data for the sample period 1961-1990, tests the Bacon-Eltis thesis by investigating the causal relationship between government expenditure and the service sector. The results of the Granger causality tests provide evidence in support of the Bacon-Eltis thesis with some feedback effects. For EU15's financial intermediation and auxiliary activities, and real estate are positively associated with total government current expenditure (European Commission, 2009b). Exports are positively associated with the following serve activities: water transport, air transport, supporting and auxiliary transport activities, and financial intermediation and auxiliary activities.

Other factors which have contributed to the development of the service sector include increase in consumption expenditures, the expansion of quality health services, and the application of information and technology (Lashmi and Kumar, 2012) investing more in research and development and incentive systems (Kim *et al.*, 2015) openness and domestic investments (Fang *et al.*, 2013) expansion of the public sector, rapid urbanization, and increased demand for intermediate and final consumer services (Singh and Kaur, 2014) population size (Mujahid and Alam, 2014) expansion of the education and health sectors (Latha and Shanmugam, 2014) and financial attractiveness and business environment, education skills, and cultural adaptability (Sethi and Gott, 2016).

4. THE MODEL AND DATA

4.1. The Model and Estimation Technique

The model used by Chenery (1960) to estimate value added per capita as a dependent variable, captured the universal effects of income and country size (population) with the argument that supply and demand factors are embedded in the level of income. His linear logarithmic regression equation was stated as follows:

$$logV_i = log\alpha_{i0} + \alpha_{i0}logY + \alpha_{i2}logN \ldots\ldots (1)$$

where V_i is per capita value added for industry i and α_{i1} and α_{i2} represent growth elasticity and size elasticity, respectively. Chenery used cross-section data of 38 countries available for any year between 1950 and 1956 to estimate this equation. This equation, which became the basis for subsequent structural change research and its modifications have been widely used in later studies. For example, Chenery and Taylor (1968) included a quadratic term for income as the decline in elasticities with rising income became apparent. Chenery and Syrquin (1975); Chenery and Syrquin (1989) later applied a more general equation, which allows a non-linear effect for population and including dummy variables to identify period effects:

$$x = \alpha + \beta_1 lny + \beta_2 (lny)^2 + \lambda_1 lnyN + \lambda_2 (lnN)^2 + \Sigma\omega_i T_i \ldots\ldots (2)$$

where x is a respective dependent variable, covering different aspects of structural change (usually expressed as a share in GDP), y is per capita GNP in 1980 US dollars, N is population in millions, and T is a dummy variable for time periods taking a non-zero value for different periods.

As discussed by Haraguchi and Rezonja (2010;2011a;2011b;2012;2015) and Haraguchi (2016) in the long term, it is assumed that sectors undergo three development stages—pre-takeoff, growth and decline—following a pattern of a cubic function. While those sectors which can sustain growth over a long period of time may have a more linear development trajectory, other sectors which experience growth from a very early stage of development and only decline at a later stage, may indicate a more quadratic pattern. As a result, they used the following equation for each sector in the group of large economies:

$$lnRVA^i_{ct} = \alpha_1 + \alpha_2 lnRGDP_{ct} + \alpha_3 lnRGDP^2_{ct} + \alpha_4 lnRGDP^3_{ct} + \alpha_c + \varepsilon^i_{ct} \ldots\ldots (3)$$

where *RVA* indicates real value added per capita; *RGDP* stands for real GDP per capita; $RGDP^2$ denotes squared real GDP per capita; $RGDP^3$ signifies cubic real GDP per capita; α_c is country fixed effect; and ε^i_{ct} is the unexplained residual.

However, as Eichengreen and Gupta (2009) argue, the stylized fact is less than clear, especially the world has changed since most of these authors wrote. For example, in the case of services, the application of information and communications technology (ICT) to the production of services has thrown into doubt the presumption that their cost necessarily rises faster than that of manufactures. Thus, ICT has allowed services that once had to be produced locally to be sourced at long distances and traded across borders. Indeed, the traditional services that once dominated – housecleaning, beauty and barber shops, lodging and meal preparation – have been increasingly supplemented by modern banking, insurance, business services, computing, and communications, among others. Therefore, it would be surprising if the association of the sectoral shares of GDP and economic development (per capita GDP) had remained the same in the face of these developments. Eichengreen and Gupta (2009) thought that the relationship may be quartic hence the following expression:

$$VAS^i_{ct} = \alpha_1 + \alpha_2 lnRGDP_{ct} + \alpha_3 lnRGDP^2_{ct} + \alpha_4 lnRGDP^3_{ct} + \alpha_5 lnRGDP^4_{ct} + \alpha_c + \varepsilon^i_{ct} \ldots\ldots (4)$$

where VAS indicates real value added share in GDP; *RGDP* stands for real GDP per capita; $RGDP^2$ denotes squared real GDP per capita; $RGDP^3$ signifies cubic real GDP per capita; $RGDP^4$ signifies quartic real GDP per capita; α_c is country fixed effect; and ε^i_{ct} is the unexplained residual.

Further, as the European Commission (2009a;2009b) (see also, Anyanwu (2018)) states, sectoral performance is driven by a myriad of distinct sources. Though, no single, comprehensive theory exists which can explain the role of these elements within a jointly integrated economic model, six groups of related factors can be identified, including

macroeconomic conditions, inputs to production, research & development (R&D) and innovation, market structure, openness and barriers to trade, and demand side factors. Macroeconomic conditions - aggregate fluctuations in GDP and employment, interest rates, exchange rates, government spending, corporate tax rates, and the change in relative prices - affect sectoral performance by defining the environment within which companies and industries operate. Inputs to production - physical capital and labor (including ICT and non-ICT assets and high- or low-skilled workers) - constitute the resource base of firms and sectors. Research & Development (R&D) and innovation - R&D expenditures and technological regimes – affect changes in the production function and the process of value-creation, more generally.

Market structure such as entry, exit, firm turnover; distribution of firms according size; sector concentration; regulatory impact and political regime determines the kind and degree of competition within the industry as well as the impact on consumer welfare and selection among heterogeneous suppliers. Openness and barriers to trade, including export openness, import penetration, FDI inflows, liberalization of trade in services, and political and social globalization indicate differences with respect to the degree of global competition and transactions between international partners within a sector. Demand side factors such as consumer expenditures, population, investment spending, government spending, net exports and demand for intermediary inputs guide the allocation of scarce resources among competing uses.

Based on the above and the extensions of Haraguchi and Rezonja (2010;2011a;2011b;2012;2015) and Haraguchi (2016) as well as Eichengreen and Gupta (2009) our extended modified relationship is expressed in equation (5) below:

$$VAS^{i}_{ct} = \alpha_1 + \alpha_2 lnRGDP_{ct} + \alpha_3 lnRGDP^{2}_{ct} + \alpha_4 lnRGDP^{3}_{ct} + \alpha_5 lnRGDP^{4}_{ct} + \alpha_6(X_{it}) + \lambda_i + \alpha_c + \varepsilon^{i}_{ct} (i = 1, \ldots., N; t = 1, \ldots., T, \ldots. (4)$$

where, as before, VAS indicates real value added share in GDP; *RGDP* stands for real GDP per capita; $RGDP^2$ denotes squared real GDP per capita; $RGDP^3$ signifies cubic real GDP per capita; $RGDP^4$ signifies quartic real GDP per capita; X is the control variables, including education (primary, secondary, and tertiary enrolment ratios), natural resource rents as percentage of GDP (oil, mining, natural gas, coal, and forest), domestic investment rate, domestic credit to the private sector (as % of GDP), trade openness, and FDI stock (as % of GDP). Other control variables are social globalization index, political globalization index, institutionalized democracy (polity2), total population (in log), information and communications technology (ICT) accessibility (proxied by mobile phone subscriptions (per 100) and fixed phone subscriptions), energy intensity level of primary energy (MJ/$2011 PPP GDP), and political rights. In addition, λ_t denotes year fixed effects, α_c is sub-regional fixed effects while ε^{i}_{ct} is an error term capturing all other omitted factors, with $E(\varepsilon_{it}) = 0$ for all *i* and *t*.

Thus, in addition to GDP per capita, we include squared, cubic and quartic terms of GDP per capita in the equation in order for the results to denote possible patterns of sectoral development in Africa, depending on the statistical significance of these GDP per capita terms.

The effect of education on sectoral shares is captured by including the shares of primary, secondary and tertiary education enrollments. Increased human capital leads to improved productivity, both in sectors and overall, while it allows for operating more complicated tasks and producing outputs that are "high-skill". High levels of human capital increase the scope that new technologies are appropriate. Also, while human capital could imply positive externalities, it is observed that foreign direct investments (FDI) tend to locate in human capital-rich places. Thus, apart from the "human capital effect" discussed in the theoretical framework, to benefit from FDI knowledge externalities and technology transfer requires that domestic firms have sufficiently high human capital levels or absorptive capacity. The education proxies may enter the equation in non-linear forms (Anyanwu, 2017;2018).

Included also is domestic investment ratio. The European Commission (2009b) notes that the average investment ratio, used as a proxy for the capital intensity, is expected to be positive as it reflects primarily the neglected capital costs. According to Tkalec and Vizek (2009) high technological intensity sectors strongly react to changes in investments. The degree of financial sector development is proxied by the ratio of domestic credit to the private sector to GDP, which is posited to enable investment in higher productivity activities, greater diversification, and risk sharing, and hence facilitate resource allocation across the economy (Levine, 2005).

Our estimates also include natural resources endowments by including the share of oil, mining, natural gas, coal and forest in GDP to account for the fact that a large fraction of economic activity in resource-rich economies in Africa is subsumed by the rents from natural resources extraction. It is posited that the endowment of abundant natural resources normally works against non-natural resources sector development, holding other conditions constant (Haraguchi and Rezonja, 2011a;2011b;2012). UNIDO (2015) shows that high natural resource endowments do not have a positive effect on a single industry. This is largely because exports of resource commodities often lead to currency appreciation, making tradable products less competitive. We also include proportion of arable land, on which the agricultural sector highly depends hence an expected positive relationship. We include factor endowments, such as population. Chenery and Taylor (1968) show that a country's population size tends to have overarching influence on economic structural change.

Following the widely held view that globalization can facilitate technology transfer and contribute to efficiencies in production, we include different globalization indicators. Two principal economic globalization indicators included are international trade openness (measured as the ratio of exports plus imports to GDP) (Matsuyama, 2009) and inward FDI stock (as percent of GDP). FDI can provide access to technology, to brand names, to global markets and has the potential to provide spillovers to the domestic economy (UNIDO, 2015). FDI may affect sectoral shares of GDP through various mechanisms: boosting productivity in the long run; filling expectations of demand increase; strengthening competition and weakening oligopoly/monopoly elements; diffusing knowledge of new production processes; stimulating the entry of firms in other sectors (horizontal linkages); and creating the right conditions to enhance structural change. Also included are KOF's indices of social globalization and political globalization.

The accessibility to ICT technology and infrastructure or service can influence sectoral shares of GDP by either facilitating or obstructing the reallocation of resources. To capture this, we include telecommunications network as proxied by mobile phone and fixed phone subscriptions. An increase in access to such ICT in a sector can contribute to increase in sectoral shares of GDP by eliminating relative price distortions and facilitating the reallocation of labor and other inputs, thereby raising sector productivity. Institutionalized democracy (polity2) and political rights capture political and institutional development.

Energy performs the work of adding value to intermediate products as they are progressively transformed into final consumer products. As UNIDO (2015) notes, resource efficiency is an important strategy for sustainable growth. Thus, sectoral production processes today have to be highly productive, less energy intensive, and more resource efficient. Energy is captured by energy intensity level of primary energy (MJ/$2011 PPP GDP).

One possible problem with the pooled OLS estimate is that it assumes that all of the right-hand side variables in the model — including real per capita GDP — are exogenous to sectoral shares in GDP However, it is possible that real per capita GDP may be endogenous to sectoral shares in GDP. Reverse causality may be taking place: real per capita GDP may be increasing sectoral shares in GDP, but sectoral shares in GDP may also be affecting the level of real per capita GDP. Without accounting for this reverse causality, the estimated coefficients may be biased. One way of accounting for possible endogenous regressors is to pursue an instrumental variables approach. Therefore, to deal with this problem, we estimate the equations, "instrumentalizing" real per capita GDP variable

with its two to four lagged levels, using a two-step (IV) estimation method, including sub-regional and time (year) fixed effects.

The consistency of the IV-2SLS estimators depends on whether the instruments are valid in the sectoral shares in GDP regressions. We examine this issue by considering the tests of over-identifying restrictions. The no rejection of the null hypothesis implies that instrumental variables are not correlated with the residual and are satisfying the orthogonality conditions required. The IV-2SLS results pass the relevant tests. For example, in columns (2) and (4) of Tables 2 and 3, the Sargan test of overidentifying restriction fails to reject that the instruments are valid, i.e., not correlated with the error term at conventional significance levels in the reported regressions. Also, the estimates pass the endogeneity test as confirmed by the Durbin and the Wu-Hausman test results.

4.2. The Data

Data for the African countries (1990 to 2011) for the variables in equations (4) and (5) are largely drawn from the World Bank (2016) except institutional democracy (polity2) from the PolityIV Project Online (2015) (see also Marshall *et al.* (2016)) KOF's indices of social globalization (comprising personal contacts, information flows, and cultural proximity) and political globalization (comprising embassies in country, membership in international organizations, participation in UN Security Council Missions, and international treaties) developed by Dreher (2006) (see also Dreher *et al.* (2008)) and political rights from "Perspective Monde". The descriptive statistics are presented in Table 1. It reports the observations, sample mean, median and standard deviation of the variables used in the estimations.

5. EMPIRICAL RESULTS

5.1. Agriculture and Services Value Added and Economic Development: Baseline Results

As observed earlier, it has been noted that the stage of economic development is the most fundamental force of structural change as the differences in supply and demand capabilities associated with changing income levels drive the emergence of certain sectors. What does the evidence show for African countries? Both the OLS and IV coefficient estimates of the economic development (real GDP per capita) in our baseline results (Table 2) show that indeed the level of economic development of a country is a fundamental factor in shaping its agricultural and services shares in GDP.

The relationship between agriculture value added in Africa and the level of economic development (log of real GDP per capita) is approximated by a quartic degree polynomial, all significant at 1 percent significant level. There is a positive significant relationship between the level of real GDP per capita and agriculture value added while there is a significant negative relationship between the quadratic real GDP per capita and agriculture value added. The cubic real GDP per capita has a significant positive relationship with agriculture value added in the continent. The quartic real GDP per capita has a significant negative relationship with agriculture value added in African countries. Figure 7 illustrates that relationship. These novel findings confirm that in the long term, agriculture value added in Africa follow a pattern of a quartic function rather than quadratic relationship previously accepted as the norm.

On the other hand**,** **t**he relationship between services value added in Africa and the level of economic development is approximated by a third degree polynomial, again, all significant at 1 percent significant level. There is a negative significant relationship between the level of real GDP per capita and services value added while there is a significant positive relationship between the quadratic real GDP per capita and services value added. The cubic real GDP per capita has a significant negative relationship with services value added in Africa. Figure 8

illustrates that relationship. Our results resemble those of Bah (2007) for the 9 developed countries, 10 Asian and 12 Latin American countries.

Table-1. Descriptive Statistics of Main Regression Variables

Variable	Observations	Mean	Median	Standard Deviation
Agriculture value added (%GDP)	1032	26.05	25.4	15.30
Services value added (%GDP)	1027	47.27	47.4	12.49
Arable land (% of total)	1163	12.21	9.2	12.08
Primary education	927	91.20	96.1	26.88
Secondary education	683	38.61	32.8	25.97
Tertiary education	606	6.22	3.4	8.07
Log of Scientific & technical journals	1110	2.87	2.89	2.04
Log of Real GDP per capita	1106	7.82	7.65	1.02
Domestic investment (%GDP)	1070	21.52	19.5	17.17
Government consumption expenditure	1043	16.05	14.7	7.67
Trade openness	1091	76.55	64.1	49.18
FDI stock (%GDP)	1148	38.02	16.2	115.60
Social globalization index	1163	25.85	23.4	11.24
Political globalization index	1163	53.06	51.91	18.97
Domestic credit to private sector (%GDP)	1077	19.57	13	21.46
Oil rent (%GDP)	1103	6.12	0	14.74
Mining rent (%GDP)	1134	1.19	0	3.45
Natural gas rent (%GDP)	1120	0.54	0	2.10
Coal rent (%GDP)	1124	0.04	0	0.34
Forest rent (%GDP)	1109	6.71	0	8.46
Log of population	1188	15.63	15.95	1.56
Age dependency ratio (Old)	1188	6.38	5.9	1.58
Age dependency ratio (Young)	1188	80.16	83.1	15.45
Mobile cellphone subscriptions (per 100 people)	1160	14.24	0.80	26.34
Log of fixed telephone subscriptions	1144	0.09	-0.11	1.39
Institutional democracy (Polity2)	1120	-0.001	-1.0	5.50
Log of Primary energy use intensity	1154	2.08	1.97	0.69
Political Rights	1067	4.70	5.00	1.12

Source: Authors' calculations, using estimation data.

Table-2. OLS and IV-2SLS Estimates of Agriculture and Services Value Added (%GDP) in Africa (with sub-regional and time fixed effects), 1990-2011: Testing Kuznets' Effects

Variable	Agriculture Value Added (%GDP): Baseline Regression Results		Services Value Added (%GDP): Baseline Regression Results	
	Pooled OLS (1)	IV-2SLS (2)	Pooled OLS (3)	IV-2SLS (4)
Log Real GDP per capita	2956.763 (5.93***)	3619.607 (6.54***)	-182.916 (-2.66**)	-240.632 (-3.19***)
Log Real GDP per capita squared	-564.107 (-6.00***)	-687.300 (-6.60***)	25.837 (2.92***)	32.263 (3.41***)
Log Real GDP per capita cube	47.129 (6.02***)	57.227 (6.62***)	-1.122 (-3.12***)	-1.401 (-3.57***)
Log Real GDP per capita quartic	-1.460 (-6.02***)	-1.769 (-6.61***)	461.515 (2.56**)	635.19 (3.19***)
Constant	-5675.970 (-5.77***)	-7006.029 (-6.39***)	-182.916 (-2.66**)	-240.632 (-3.19***)
Sub-regional and Year Dummies	Yes	Yes	Yes	Yes
R-Squared	0.6286	0.6273	0.2554	0.2740
F-stat/Wald chi^2	57.72	1633.67	12.08	329.05
Prob > chi^2	0.0000	0.0000	0.0000	0.0000
N	1019	968	1015	871
Tests of overidentifying restrictions				
- Sargan		1.25296 (p=0.2630)		5.14054 (p=0.7425)
- Basmann		1.2157 (p=0.2702)		4.9692 (p=0.7609)
Tests of endogeneity				
- Durbin		3.79302 (p=0.4347)		2.74534 (p=0.4326)
Wu-Hausman		0.919532 (p=0.4518)		0.88744 (p=0.4471)

Note: t-values are in parentheses; ***= 1% significant level; **=5% significant level; *=10% significant level.
Source: Authors' Estimations.

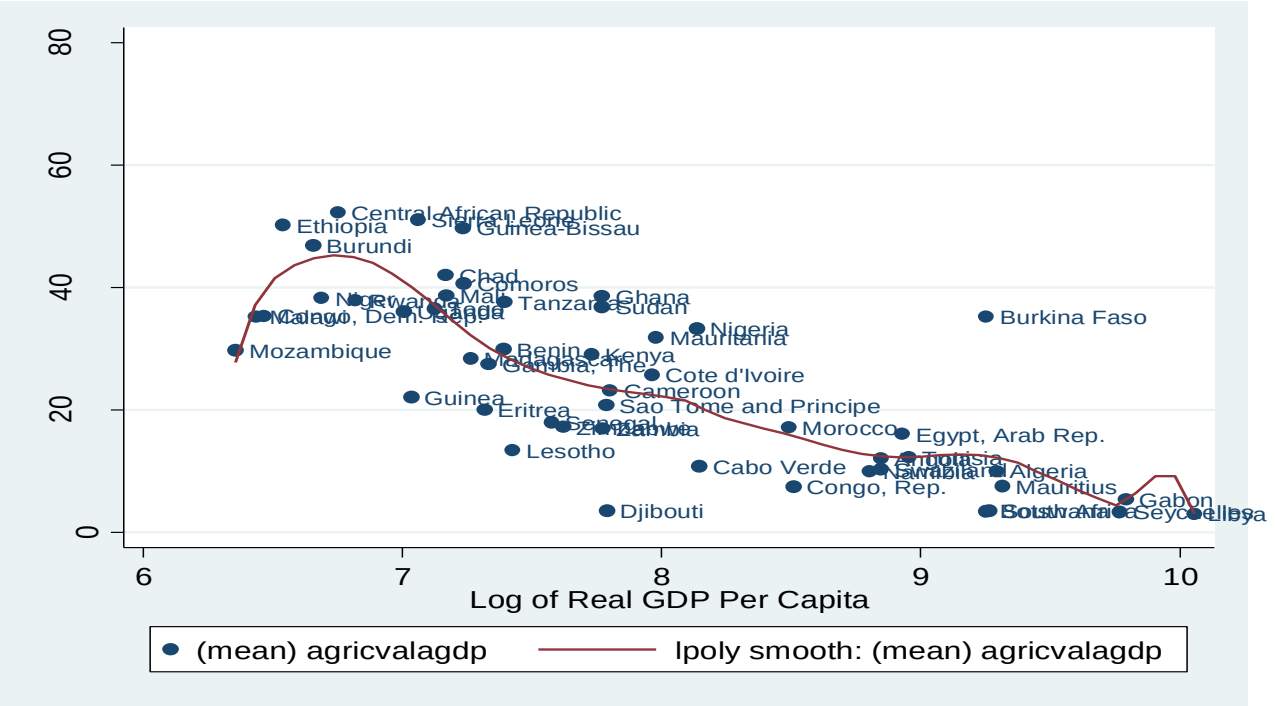

Figure-7. Scatter Plot of Average Agriculture Value Added (% of GDP) and Log of Real GDP Per Capita in Africa
Source: Authors, using estimation data.

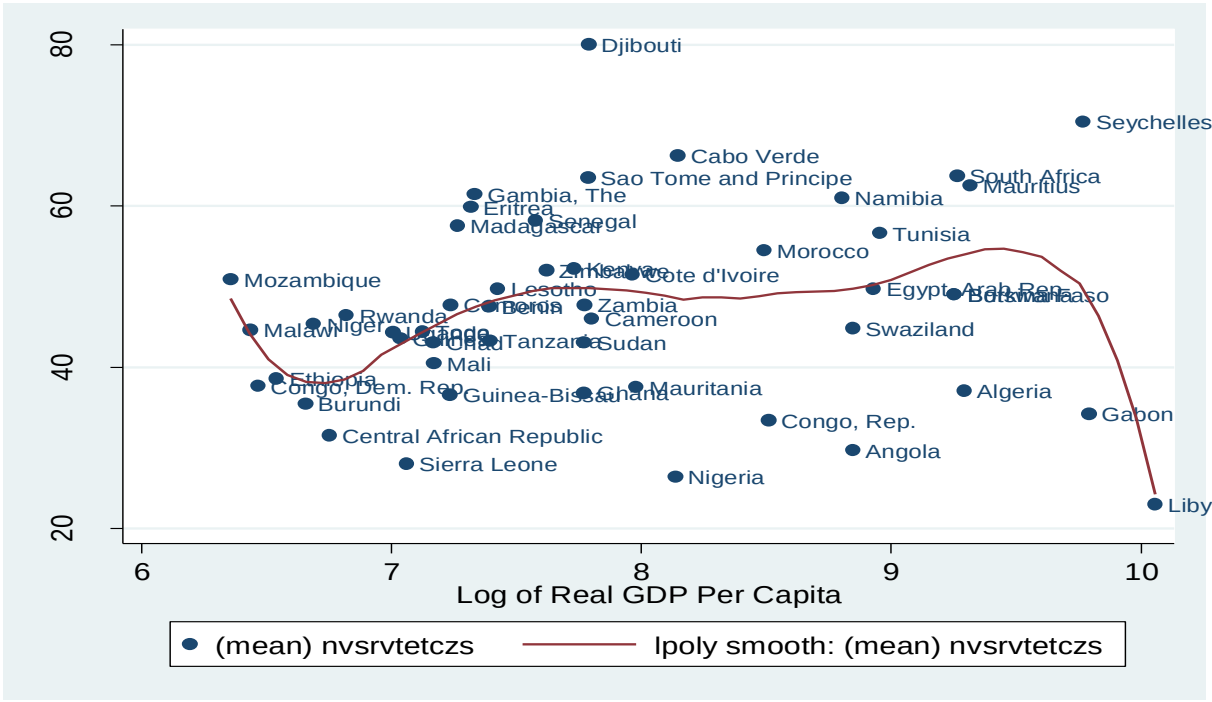

Figure-8. Scatter Plot of Average Services Value Added (% of GDP) and Log of Real GDP Per Capita in Africa
Source: Authors, using estimation data.

5.2. Full Controls and Robustness Check

In Table 3, we investigate the robustness of our results when all key controls are included in the equation (that is, equation (5)). Columns (1) and (2) respectively, present the pooled OLS and IV estimates of the role of economic development and other key (control) drivers of agriculture value added. In columns (4) and (5), we present the pooled OLS and IV estimates of the role economic development and other key (control) drivers of services value added in the continent, representing full controls and robustness check.

The estimates show that the results of our baseline estimates for economic development effects remain robust when we simultaneously control for all key variables for both agriculture and services value added in African countries. Interestingly, in accordance with the OLS results, our IV-2SLS estimates indicate strong support for a non-monotonic quartic relationship between economic development and agriculture value added, with a positive leading coefficient. Our results also show strong support for a non-monotonic third degree polynomial (cubic) relationship between economic development and services value added, with a negative leading coefficient. Thus, the effects of economic development do not appear to be driven by other drivers of agriculture and services value in Africa.

Our OLS (columns (1) and (2) and IV results (columns (3) and (4) of Table 3) show that primary education effects estimates are similar in size and statistical level of significance for each of agriculture and services value added. They show that primary education has a significant cubic relationship (with positive leading coefficient) with agriculture value added but a U-shaped relationship with services value added – both significant at the 1 percent level of significance. For services, for example, the results suggest that although higher levels of primary education is negatively associated with services value added, the effect is not constant. Rather, for levels of primary education, above a certain point, higher levels of education act to increase services value added, holding other factors constant. This relationship suggests also that the marginal effect of primary education exhibits an increasing returns for services value added in African countries.

Our estimates also indicate a strong support for a non-monotonic U-shaped relationship between secondary and tertiary education and agriculture value added development in Africa. As in the case of primary education and services value added, the relationship suggests that the marginal effects of secondary and tertiary education exhibit increasing returns for agriculture value added in African countries. On the other hand, secondary education enrollment is negative and marginally statistically significantly correlated with services value added in the continent. This shows that services value added in Africa do not necessarily require higher levels of education as also confirmed by the results of Dabla-Norris *et al.* (2013).

Domestic investment rate has negative and statistically significant effect on agriculture value added in Africa. As seen in Table 3 (columns (1) and (2), domestic investment rate is negative in sign and significant at the 1 percent level. Our estimates from the IV results, suggest that, on average, a one percentage increase in the share of domestic investment rate is associated with about 0.2 percentage decrease in agriculture value added in African countries. Our result agrees with those of Anyanwu and Kponnou (2017) for food, beverages and tobacco in Africa. It also agrees with those of European Commission (2009a) which concludes that investment is a less important driver (in terms of the magnitude of the industry-specific elasticities) for primary industries in comparison to secondary and tertiary industries.

Government expenditure as a percent of GDP, a government policy variable used to test the Bacon-Eltis Thesis, appears to significantly (at 1 percent significant level in the IV results) reduce agriculture value added in Africa. This confirms the Bacon-Eltis Thesis with respect to agriculture value added in Africa. Our IV estimates suggest, for example, that a one percentage point increase in government consumption expenditure is associated with a decline in agriculture value added by 0.34 percentage points in the continent. Our results, therefore, mean that increase in government consumption spending crowds out agriculture value added in African countries. On the other hand, government expenditure as a percent of GDP appears to significantly (at 1 percent significant level in both the OLS and IV results) increase reduce agriculture value added in Africa.

Table-3. OLS and IV-2SLS Estimates of the Key Drivers of Agriculture and Services Value Added (%GDP) in Africa (with sub-regional and time fixed effects), 1990-2011

	Agriculture Value Added: Regression Results with Full Control Variables and Robustness Check		Services Value Added: Regression Results with Full Control Variables and Robustness Check	
	Pooled OLS (1)	**IV-2SLS (2)**	**Pooled OLS (3)**	**IV-2SLS (4)**
Log Real GDP per capita	2066.058 (2.15**)	2051.501 (2.19**)	-305.904 (-3.11***)	-313.492 (-3.31***)
Log Real GDP per capita squared	-394.893 (-2.10**)	-398.132 (-2.17**)	38.030 (2.99***)	38.659 (3.16***)
Log Real GDP per capita cube	33.257 (2.06**)	34.053 (2.15**)	-1.575 (-2.89***)	-1.578 (-3.02***)
Log Real GDP per capita quartic	-1.042(-2.01**)	-1.084 (-2.13**)		
Primary education	1.423 (4.60***)	1.690 (5.46***)	-0.531 (-6.14***)	0-0.687 (-7.87***)
Primary education squared	-0.014 (-3.66***)	-0.016 (-4.49***)	0.003 (6.53***)	0.004 (8.31***)
Primary education cube	0.00004 (2.89***)	0.0001 (3.63***)		
Secondary education	-0.394 (2.92***)	-0.271 (-2.13**)	-0.015 (-0.31)	-0.079 (-1.81*)
Secondary education squared	0.004 (2.83***)	0.003 (2.24**)		
Tertiary education	-1.140 (-3.71***)	-1.297 (-4.46***)	-0.076 (-0.61)	0.017 (0.15)
Tertiary education squared	0.014 (2.56**)	0.019 (3.41***)		
Domestic investment (%GDP)	-0.173 (3.35***)	-0.157 (-3.28***)	0.008 (0.18)	-0.001 (-0.02)
Government consumption expenditure (%GDP)	-0.256 (-2.53**)	-0.336 (-3.45***)	0.379 (4.35***)	0.350 (4.27***)
Trade openness	-0.003 (-0.14)	0.011 (0.53)	-0.032 (-1.70*)	-0.021 (-1.23)
FDI stock (%GDP)	-0.0001 (-0.0)	-0.043 (-1.18)	0.030 (0.98)	0.076 (2.45**)
Social Globalization Index	-0.334 (-2.17**)	-0.262 (-2.59***)	0.266 (2.94***)	0.217 (2.53**)
Political Globalization Index	-0.156 (-4.12***)	-0.202 (-5.37***)	0.173 (5.26***)	0.143 (4.79***)
Domestic credit to private sector (%GDP)	0.084 (1.93*)	0.142 (3.16***)	0.091 (2.42**)	0.092 (2.44**)
Oil rent (%GDP)	-0.055 (-0.73)	-0.081 (-1.11)	-0.245 (-4.00***)	-0.390 (-6.96***)
Mining rent (%GDP)	-0.111 (-1.05)	-0.113 (-1.14)	-0.444 (-4.74***)	-0.469 (-5.77***)
Natural gas rent (%GDP)	-0.113 (-0.48)	-0.099 (-0.45)	-0.290 (-1.66*)	-0.046 (-0.31)
Coal rent (%GDP)	-5.816 (-0.77)	-0.632 (-0.09)	-4.380 (-0.66)	12.23461 (2.03**)
Forest rent (%GDP)	0.150 (1.17)	0.093 (0.76)	-0.411 (-3.71***)	-0.503 (-4.99***)
Log of population	1.638 (2.31**)	2.162 (3.21***)	-1.069 (-1.70*)	-1.684 (-2.92***)
Mobile phone subscriptions (%)	-0.027(-0.59)	-0.018 (-0.44)	-0.018 (-0.48)	0.012 (-0.38)
Log of fixed telephone subscription	-2.653 (-2.31**)	-2.849 (-2.57**)	3.257 (3.30***)	1.998 (2.26**)
Institutional Democracy (Polity2)	-0.195 (-1.64*)	0.989 (2.03**)	0.117 (1.13)	0.037 (0.34)
Institutional Democracy (Polity2) squared		-0.050 (-2.29**)		
Log of primary energy use intensity	-1.744 (-1.28)	-2.964 (-2.23**)	-0.108 (-0.09)	1.663 (1.44)
Political rights	-1.513 (-3.60***)	-1.299 (-3.20***)	1.136 (3.05***)	0.174 (0.49)
Arable land	0.096 (1.85*)	0.118 (2.30**)	-0.130 (-2.98***)	-.0118 (-2.83***)
Constant	-4002.383 (-2.17**)	-3941.587 (-2.20**)	876.258 (3.46***)	935.941 (3.82***)

R-Squared	0.8254	0.8337	0.7825	0.8334
F-stat/Wald chi²	25.56	1622.85	21.30	1410.14
Prob > chi²	0.0000	0.0000	0.0000	0.0000
N	347	324	347	282
Tests of overidentifying restrictions				
- Sargan		1.25296 (p=0.2630)		11.8763 (p = 0.1568)
- Basmann		1.2157 (p=0.2702)		9.93631 (p = 0.2695)
Tests of endogeneity				
- Durbin		3.79302 (p-0.4347)		5.13905 (p = 0.1619)
- Wu-Hausman		0.919532 (p=0.4518)		1.42926 (p = 0.2350)

Note: t-values are in parentheses; ***= 1% significant level; **=5% significant level; *=10% significant level.

Source: Authors' Estimations.

Our IV estimates suggest, for example, that a one percentage point increase in government consumption expenditure is associated with an increase in services value added by 0.35 percentage points in the continent. This rejects the Bacon-Eltis Thesis with respect to services value added in Africa – a result opposed to that of Ansari (1994) for Canada.

We investigated aspects of globalization that have been implicated as key drivers of structural change. Our results show that increases in trade openness is only marginally significantly associated with a decrease in services value added in the OLS results – but without any significant effect on agriculture value added. On the other hand, our results indicate that increases in inward stock of foreign direct investment (FDI) are associated with significant increase in services value added as shown in our IV result contrary to the results of Dabla-Norris *et al.* (2013).

Another innovative aspects of this paper is the inclusion of other aspects of globalization, namely social and political globalization. Our results show that both social and political globalization are negatively and significantly associated with agriculture value added in African countries. This shows that African countries' international personal contacts, information flows, cultural proximity, embassies in country, membership in international organizations, participation in UN Security Council Missions, and international treaties help to generate influences that decrease value added in agriculture. On the other hand, our results show that both social and political globalization are positively and significantly associated with services value added. These indicate, not surprisingly, that African countries' international personal contacts, information flows, cultural proximity, embassies in country, membership in international organizations, participation in UN Security Council Missions, and international treaties help to generate influences that increase value added in services.

The domestic credit variable in our estimations has positive and statistically significant effects on both agriculture and services value added. Our IV estimates indicate that a one percentage point increase in domestic credit to the private sector is associated with an increase in agriculture and services value added, respectively, by 0.14 and 0.09 percentage points in the continent. Dabla-Norris *et al.* (2013) find significantly negative effect for domestic credit on agriculture value added.

With respect to the role of natural resources, our results indicate that none of the resources had any significant effect on agriculture value added. Dabla-Norris *et al.* (2013) find negative effect from mining output share. However, oil, mineral and forest resource dependence have significant negative association with services value added in Africa. Natural resource curse seems to be at work here. These results agree with those of Dabla-Norris *et al.* (2013) for services value added. However, dependence on coal has positive and significant association with increases in services value added in our IV result.

Our results also indicate that population is significantly and positively associated with agriculture value added but significantly and negatively associated with services value added. Dabla-Norris *et al.* (2013) surprisingly find negative population effect on both agriculture and service value added.

ICT infrastructure yield interesting results. For example, mobile subscriptions do not have any significant association with either of agriculture value added or service value added. This is hardly surprising since most mobile phone subscriptions are used, especially by the youth, for social media and Internet "browsing". However, fixed phone subscriptions are significantly and negatively associated with agriculture value added but have significant positive association with services value added as would be expected.

We next assess whether the quality of political institutions affects the two sectoral shares in GDP. Institutional democracy has a significant inverted U-shaped relationship with agriculture value added as shown in our IV results. Thus, while institutionalized democracy may promote agriculture value added, it eventually hinders it as countries mature in institutional democracy. Political rights (given the coding with 7 as repressive) are positively associated with agriculture value added but negatively associated with services value added.

Primary energy use intensity has a significant negative association with agriculture value added. And as is expected, arable land has significant positive association with agriculture value added but the opposite effect on services value added.

6. CONCLUSION AND SOME POLICY RECOMMENDATIONS

The services sector in Africa has risen steadily as a share of GDP. This has increasingly been driven by government consumption expenditure, social globalization, political globalization, domestic credit to the private sector, fixed telephone subscription, and political rights. At the same time, the continued high level of agriculture value added as a share of GDP has been driven largely by initial level of economic development, domestic credit to the private sector, population size, and availability of arable land.

At present the opinion seems to be divided on whether or not the relative expansion of the services sector in Africa has any long-term growth implications. UNECA (2015) sees the services sector as an avenue for economic transformation, as not all countries have a competitive edge in manufacturing (see also Uwitonze and Heshmati (2016)). Authors like Wu (2007); Shingal (2014) and Singh and Kaur (2014) have claimed that India and China have recorded attractive economic growth that is closely associated with the dramatic development of the services sector. In some African countries, services are considered as an alternative to manufacturing-led development. Indeed, Stiglitz (2017) challenges the notion that Africa can follow the Asian growth model of manufacturing export-led, the now famous Asian miracle. Instead, he claims services will be the growth sector in the future. According to him, this new development paradigm is a challenge for African government for the current development strategy calls for improving all the upstream and downstream linkages between agriculture and manufacturing sectors to boost competitiveness and innovation. For him, new strategies will have to achieve what manufacturing-led growth achieved but through a multi-pronged strategy involving all major sectors of the economy.

If the services sector is to play an important role in Africa's economic transformation and development, what are the implications of our results for these countries? First, to make government consumption expenditure work for services value added development in Africa, efforts to reform the fiscal system for consolidation by both the executive and legislative arms of government are imperative to avoid wastes, corruption and crowding out resources for public sector investment. In addition, public spending on education (as well as on health and other human capacity), when targeted at the poor, can produce a quadruple dividend, increasing services and economic development in the short- and medium-term.

In addition, achieving government expenditure effectiveness must also remain an active goal of governments in Africa. Adoption of high level best practice principles to inform the development of these processes will help African governments achieve this. Those broad principles should include the following key elements: a nationally coordinated approach to the development of significant strategic projects and programs; and the promotion of competitive markets. Others relate to decision-making based on rigorous cost-benefit analysis to ensure the highest economic and social benefits to the nation over the long term; a commitment to transparency at all stages of the decision-making and project implementation processes; and a public sector financial management regime with clear accountabilities and responsibilities.

Second,, since inward FDI inflows is associated with increases in services value added, African governments must make efforts to improve the efficiency and effectiveness of public institutions, while increasing investment in the quality of human capital so as to generate the requisite skills required in a competitive global environment and make FDI stock more productive. In addition, governments should respect private property rights, allow the rule of law to prevail as well as improve the legal, judicial, and regulatory, and infrastructural environment that make for more productive FDI stock.

Third, to make globalization work for increased services value added, one of the key things Africa needs in harnessing the positive aspects of political globalization will involve multi-stakeholder and multi-sectoral partnerships across borders that can combine the assets, creativity, and experience of the strategic partners, leveraging their resources for people-oriented development. Such innovative, cross-border multi-stakeholder and multi-sectoral partnerships must be ones characterized by shared vision, interdependence and complementarity, joint resources mobilization and resources sharing, deepening of sub-regional integration, joint investments in human and social capital as well as physical infrastructure (especially communications and transportation) with prospects for scaling up and institutionalization, and very strong endorsement and consistent support from senior leadership. These are the basic ingredients for the success of such new strategic alliances. The key role of government under such strategic alliances is that of an enabler, providing a 'level-playing' field, embedding of social objectives in external relations, building the legal, institutional and regulatory frameworks for social and political globalization to thrive – as opposed to excessive or cumbersome regulatory barriers that stifle incentives and discourage enterprise, free exchange and harmonious co-existence. Also, urgent reforms to make multilateral organizations more representative, cooperative and coordinated in decision-making, fairer, more balanced, equitable, participatory, democratic, accountable, transparent and coherent are needed at the level of the United Nations.

Fourth, for social globalization to work for services value added and economic transformation of Africa, public-private partnerships and interventions are required to enhance personal contacts (interconnectedness with other countries through international telephone connection, tourism promotion, functional international airports and visa-friendly policies), information flows (international students' exchanges, trade in high technology goods, access to Television and the Internet, freedom of the press and international Internet connections), and cultural proximity (trade in cultural goods, international trade mark registrations, civil rights (freedom of citizens), gender equality and public spending on education) across national boundaries.

Fifth, for domestic credit to work for the services and agriculture value added development, lending rates reduction is imperative, especially through a more financial competitive environment while developing the requisite lending expertise, mechanisms for monitoring, and supervisory and regulatory skills of operators of the African financial system. Some deliberate and focused credit targeting (for example towards agro-processors and small and medium service enterprises) will be of immense help in this direction.

Sixth, given our results with respect to the effects of fixed telephone subscriptions (an ICT and infrastructure indicator) on services value added, the prioritization of ICT investments that have the greatest impact on service value added share will be imperative. Improving fixed telephone infrastructure's impact on services share in GDP does not only entail physical access but affordability as well. This requires ensuring that the poor benefit from savings in operating costs, and that the resulting change in telephone services is affordable to the poor or low-income group. Here the primary policy instrument is to ensure effective competition in telephone services, allowing operators to set their own fares and new operators to enter the market so that efficiency is encouraged. This is because, the lower the level of fare and entry regulation, the higher the chance of telephone infrastructure investment contributing services value added and economic transformation of Africa.

Seventh, greater political rights - protection of individuals' freedom from infringement by governments, social organizations, and private individuals and citizens' ability to participate in the civil and political life of the society and state without discrimination or repression - matter for increased services value added. This calls for inclusive governance that ensures the provision of services and opportunities for people from different religions, ideologies and ethnicities without discrimination. It also calls for a sustained commitment to democracy that will ensure the embrace and guarantee of equal citizenship, political pluralism, freedom, human rights, general respect for others, and socio-political cum economic inclusion. This will also ensure that public frustrations are expressed at the ballot

box, in the media, and in peaceful assemblies, with the state actively responding with corrective policies rather than simply suppressing criticisms and opposition.

Funding: This study received no specific financial support.
Competing Interests: The authors declare that they have no competing interests.
Contributors/Acknowledgement: Both authors contributed equally to the conception and design of the study.

REFERENCES

Acemoglu, D. and V. Guerrieri, 2008. Capital deepening and nonbalanced economic growth. Journal of Political Economy, 116(3): 467-498.Available at: https://doi.org/10.1086/589523.

Ansari, M.I., 1994. Structural effects of government expenditure an empirical test of the bacon-eltis thesis. South African Journal of Economics, 62(4): 243-251.Available at: https://doi.org/10.1111/j.1813-6982.1994.tb01236.x.

Anyanwu, J.C., 2017. Manufacturing value added development in North Africa: Analysis of key drivers. Asian Development Policy Review, 5(4): 281-298.Available at: https://doi.org/10.18488/journal.107.2017.54.281.298.

Anyanwu, J.C., 2018. Does human capital matter in manufacturing value added development in Africa? Asian Journal of Economic Modelling, 6(3): 294-317.Available at: https://doi.org/10.18488/journal.8.2018.63.294.316.

Anyanwu, J.C. and M. Kponnou, 2017. Accelerating agro-manufacturing to feed Africa. African Development Review, 29(S2): 78-95.Available at: https://doi.org/10.1111/1467-8268.12264.

Bacon, R. and W. Eltis, 1978. Britain's economic problem: Too few producers. 2nd Edn., London: Macmillan.

Bah, E.-H.M., 2011. Structural transformation paths across countries. Emerging Markets Finance and Trade, 47(sup2): 5-19.Available at: https://doi.org/10.2753/ree1540-496x4703s201.

Bah, E.M., 2007. Structural transformation in developed and developing countries. MPRA Paper No. 10655. Germany: University Library of Munich. pp: 31.

Baumol, W.J., 1967. Macroeconomics of unbalanced growth: The anatomy of urban crisis. The American Economic Review, 57(3): 415-426.

Berlingieri, G., 2014. Outsourcing and the Rise in services, London School of Economics, Centre for Economic Performance, CEP Discussion Paper No. 1199.

Bruno, M. and J. Sachs, 1982. Energy and resource allocation: A dynamic model of the dutch disease. The Review of Economic Studies, 49(5): 845-859.Available at: https://doi.org/10.2307/2297191.

Buera, F.J. and J.P. Kaboski, 2009. Can traditional theories of structural change fit the data? Journal of the European Economic Association, 7(2-3): 469-477.Available at: https://doi.org/10.1162/jeea.2009.7.2-3.469.

Chan, K.S. and S.-H. Park, 1989. A cross-country study on the role of the service sector. Journal of Economic Development, 14(2): 35-54.

Chenery, H. and M. Syrquin, 1975. Accumulation and allocation processes patterns of development: 1950-1970. Washington, DC: Oxford University Press.

Chenery, H.B., 1960. Patterns of industrial growth. The American Economic Review, 50(4): 624-654.

Chenery, H.B., 1961. Comparative advantage and development policy. The American Economic Review, 51(1): 18-51.

Chenery, H.B. and M. Syrquin, 1989. Patterns of development, 1950 to 1983, discussion paper No. 41. Washington, DC: World Bank.

Chenery, H.B. and L. Taylor, 1968. Development patterns: Among countries and over time. The Review of Economics and Statistics, 50(4): 391-416.Available at: https://doi.org/10.2307/1926806.

Corden, W. and J. Neary, 1984. Booming sector and de-industrialisation in a small open economy. The Economic Journal, 92(368): 825-848.Available at: https://doi.org/10.2307/2232670.

Cornwall, J., 1977. Modern capitalism: Its growth and transformation. London: Martin Robertson.

Dabla-Norris, E., A. Thomas, R. Garcia-Verdu and Y. Chen, 2013. Benchmarking structural transformation across the world. IMF Working Paper WP/13/176.

Dreher, A., 2006. Does globalization affect growth? Evidence from a new index of globalization. Applied Economics, 38(10): 1091-1110.Available at: https://doi.org/10.1080/00036840500392078.

Dreher, A., N. Gaston and M.P. Pim, 2008. Measuring globalization - gauging its consequence. New York: Springer.

Eichengreen, B. and P. Gupta, 2009. The two waves of service sector growth. NBER Working Paper Series, Working Paper No. 14968.

Engel, E., 1857. The production and consumption conditions of the Kingdom of Saxony. Journal of the Statistical Bureau of the Royal Saxon Ministry of the Interior, 8(9): 1-54.

European Commission, 2009a. Sectoral growth drivers and competitiveness in the European Union. Luxembourg: European Commission.

European Commission, 2009b. European competitiveness report 2008. Luxembourg: European Commission.

Fang, K., X. Hong, S. Li, M. Song and J. Zhang, 2013. Choosing competitive industries in manufacturing of China under low-carbon economy: A three-stage DEA analysis. International Journal of Climate Change Strategies and Management, 5(4): 431-444.Available at: https://doi.org/10.1108/ijccsm-09-2012-0054.

Fels, G., K. Schatz and F. Wolter, 1971. The interdependence between the structure of production and the level of development. Weltwirtschaftliches Archiv, Heft 2, 106: 240-278.

Fixler, D.J. and D. Siegel, 1999. Outsourcing and productivity growth in services. Structural Change and Economic Dynamics, 10(2): 177-194.Available at: https://doi.org/10.1016/s0954-349x(98)00048-4.

Haraguchi, N., 2016. Patterns of manufacturing change and structural development. In Weiss, J. and Tribe, M. A. (Eds), Routledge handbook of industry and development. Abingdon and New York: Routledge.

Haraguchi, N. and G. Rezonja, 2010. In search of general patterns of manufacturing development, Development Policy and Strategic Research Branch Working Paper No. 02/2010. Vienna: UNIDO.

Haraguchi, N. and G. Rezonja, 2011a. Emerging patterns of manufacturing structural change, UNU-WIDER Working Paper 2011/43. Helsinki: UNU World Institute for Development Economics Research (UNU-WIDER).

Haraguchi, N. and G. Rezonja, 2011b. Unravelling manufacturing development: The role of comparative advantage, productivity growth and country-specific conditions, UNIDO Development Policy, Statistics and Research Branch Working Paper, No. 16/2011, UNIDO, Vienna.

Haraguchi, N. and G. Rezonja, 2012. Unravelling manufacturing development: The role of comparative advantage, productivity growth and country-specific conditions, UNIDO Development Policy, Statistics and Research Branch Working Paper, No. 16/2011, UNIDO, Vienna.

Haraguchi, N. and G. Rezonja, 2015. Structural change in the BRICS' manufacturing industries. In Naude, W., Szirmai, A. and Haraguchi, N. (Eds.), Structural Change and Industrial Development in the BRICS. Oxford: Oxford University Press.

Herrendorf, B., R. Rogerson and A. Valentinyi, 2013. Two perspectives on preferences and structural transformation. American Economic Review, 103(7): 2752-2789.Available at: https://doi.org/10.1257/aer.103.7.2752.

Imbs, J., C. Montenegro and R. Wacziarg, 2012. Economic integration and structural change. Political Economy Seminar, Toulouse.

Jalava, J., 2006. Production, primary, secondary and tertiary: Finnish growth and structural change. Pellervo Economic Research Institute Working Papers No. 80, January, 1860-2004.

Jones, C., 2013. Misallocations, economic growth, and input-output economics, advances in economics and econometrics. Cambridge: Cambridge University Press, 2: 419-456.

Kasper, W., 1978. Australia's economic and industrial structures: Past patterns and prospective trends. In Kasper W and Parry T G (eds), Growth, Trade and Structural Change in an Open Australian Economy. Sydney: University of New South Wales. pp: 90-124.

Kim, M., J. Song and J. Triche, 2015. Toward an integrated framework for innovation in service: A resource-based view and dynamic capabilities approach. Information Systems Frontiers, 17(3): 533-546.Available at: https://doi.org/10.1007/s10796-014-9505-6.

Kongsamut, P., S. Rebelo and D. Xie, 2001. Beyond balanced growth. The Review of Economic Studies, 68(4): 869-882.

Kongsamut, P., R. Sergio and X. Danyang, 1999. Beyond balanced growth. NBER Working Paper No. 6159.

Kuznets, S., 1953. Shares of upper income groups in income and savings. Cambridge, Mass: National Bureau of Economic Research.

Lashmi, P. and S. Kumar, 2012. A study of factors affecting the India's service sector: An econometric analysis. International Journal of Business Management & Economic Research, 3(2): 490-497.

Latha, C. and V. Shanmugam, 2014. Growth of service sector in India. IOSR Journal of Humanities and Social Science, 19(1): 8-12.

Levine, R., 2005. Finance and growth: Theory and evidence. In Aghion. P. and Steven N. Durlauf, S. N. (Eds), Handbook of economic growth. 1st Edn., Amsterdam: Elsevier B.V, 1A, 1: 866-910.

Marshall, M.G., T.R. Gurr and K. Jaggers, 2016. Polity IV project: Political regime characteristics and transitions, 1800-2015. Vienna: Center for Systemic Peace.

Matsuyama, K., 2009. Structural change in an interdependent world: A global view of manufacturing decline. Journal of the European Economic Association, 7(2-3): 478-486.Available at: https://doi.org/10.1162/jeea.2009.7.2-3.478.

Mujahid, H. and S. Alam, 2014. Service sector as an engine of growth: Empirical analysis of Pakistan. Asian Economic and Financial Review, 4(3): 377-386.

Nelson, R., J.W. Wheeler and I. Leveson, 1980. Western economies in transition: Structural change and adjustment policies in industrial countries. London: Groom Helm.

Neuss, V.L., 2017. Economic development and structural change. Ph.D. Thesis in Economics and Management, HEC Liège, Management School, University of Liège. pp: 224.

Ngai, L.R. and C.A. Pissarides, 2007. Structural change in a multisector model of growth. American Economic Review, 97(1): 429-443.Available at: https://doi.org/10.1257/aer.97.1.429.

Pasinetti, L., 1981. Structural change and economic growth: A theoretical essay on the dynamics of the wealth of nations. Cambridge: Cambridge University Press.

Rodrik, D., 2016. Premature deindustrialization. Journal of Economic Growth, 21(1): 1-33.

Rowthorn, R., 1994. Korea at the cross-roads. Economic and Social Research Council Centre for Business Research Working Paper No. 11, University of Cambridge, Cambridge, United Kingdom.

Rowthorn, R. and J.R. Wells, 1987. De-industrialization and foreign trade. Cambridge, United Kingdom: Cambridge University Press.

Sethi, A. and J. Gott, 2016. 2016 A. T. Kearney global services location index, A.T. Kearney Inc, England and Wales. Available from https://www.atkearney.com/strategic-it/global-services-location-index.

Shingal, A., 2014. The service sector in India's state: A tale of Growth, convergence and trade. World Economy, 37(12): 1773-1793.Available at: https://doi.org/10.1111/twec.12163.

Singh, A., 1977. UK industry and the world economy: A case of de-industrialization?. In Welfare aspects of industrial markets. Boston, MA: Springer. pp: 183-214.

Singh, M. and K. Kaur, 2014. India's services sector and its determinants: An empirical investigation. Journal of Economics and development Studies, 2(2): 385-406.

Sposi, M., 2015. Evolving comparative advantage, sectoral linkages, and structural change. Federal Reserve Bank of Dallas Working Paper No. 231.

Stiglitz, J.E., 2017. From manufacturing led export growth to a 21st century inclusive growth strategy for Africa. Growth Summit Hosted by the Bureau for Economic Research, Economic Research Southern Africa and the Research Project on Employment, Income Distribution and Inclusive Growth, Cape Town, South Africa, November 15, 2017.

Szirmai, A., 2012. Industrialisation as an engine of growth in developing countries, 1950–2005. Structural Change and Economic Dynamics, 23(4): 406-420.Available at: https://doi.org/10.1016/j.strueco.2011.01.005.

Thirlwall, A.P., 1978. The UK's, economic problems: A balance of payments constraint? National Westminster Bank Quarterly Review, February: 24-32.

Tkalec, M. and M. Vizek, 2009. The impact of macroeconomic policies on manufacturing production in croatia. Economic Trends and Economic Policy, 121: 61-92.

UNCTAD, 1995. Trade and development report. Geneva and New York: United Nations.

UNCTAD Virtual Institute, 2016. Virtual institute teaching material on structural transformation and industrial policy. New York and Geneva: United Nations.

UNECA, 2015. Economic report on Africa 2015: Industrializing through trade. Addis Ababa: UNECA.

United Nations Industrial Development Organization (UNIDO), 2015. Industrial Development Report 2016: The Role of Technology and Innovation in Inclusive and Sustainable Industrial Development, UNIDO, Vienna.

Uwitonze, E. and A. Heshmati, 2016. Service sector development and its determinants in Rwanda. IZA Discussion Paper No. 10117.

World Bank, 2016. World development indicators 2016. Washington, DC: World Bank.

Wu, Y., 2007. Service sector growth in China and India: A comparison. China: An International Journal, 5(1): 137-154.Available at: https://doi.org/10.1353/chn.2007.0007.