# Does structural economic transformation drive Inclusive growth? New evidence from industrial upgrading in Africa

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## Abstract

*Does structural economic transformation influence Inclusive growth? And to what extent does industrial upgrading matter in this relationship within the context of Africa? Using a panel of 17 African countries cutting across all regions and spanning almost three decades (1991-2017), the study employed the Augmented Mean Group estimator with heterogeneous coefficients on previously unexplored measures of structural transformation and inclusive growth to provide new insights on this relationship. The a priori expectation is that structural transformation and diversification would have a positive and significant influence on inclusive growth. The results provide a mixed evidence of industrial upgrading leading to inclusive growth. In most of the measures of structural transformation, majority of the countries seem to exhibit a positively significant relationship except for manufacturing to non-manufacturing ratio and the tradable to non-tradable services to a lesser extent. Overwhelmingly, the results suggest that the upper middle-income countries comprising South Africa, Mauritius and Botswana and few high-performing lower-middle income countries including Egypt, Ghana and Lesotho as well as low-income countries seem to be the top performers in almost every measure of industrial upgrading.*

**Keywords**: structural economic transformation, Industrial upgrading, Inclusive development, Africa

## 1. Introduction

Does structural economic transformation influence inclusive growth and human development? And to what extent does industrial upgrading matter in this relationship within the context of Africa? Widespread public concerns over the rising inequality and the resulting public efforts to stem the tide has thrust inclusive growth to the front burner of public policy for governments, especially in Africa (Dabla-Norris et al 2015).

A growing body of evidence highlight the multifaceted cost of inequality. For instance, inequality has detrimental effects on economic growth by stifling productivity growth and weakening political institutions (World Bank, 2006; ECLAC, 2018). It fosters poor health outcomes, as societies with high inequality tend to have higher incidence of diseases and lower life expectancy (Karlsson, et al 2010)

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and low educational attainment (Lim, Gemici and Karmel, 2013). Moreover, studies have shown that inequality fosters socio-economic and political instability by breeding distrust, greed, crime, corruption, social division and economic instability (Bardhan, 2005; Rajan, 2010 Kumhof, Rancière and Winant, 2015).

Lundberg and Sguire (2003) noted that empirical literature on the relationship between inequality and economic development could be classified into two strands. The first strand uses the structural transformation approach with industrial structural transformation via inter-sectoral factor (capital and labour) mobility pioneered by Lewis (1954) and Kuznet (1955); and second strand, is the macroeconomic approach with emphasis on the mutually exclusivity of growth and inequality pioneered by Baro and Sala-i-martin (1995). The present study belongs to the structural transformation tradition by emphasizing the role of industrial upgrading and inter-sectoral labour mobility in reducing social inequality of opportunities and thus fostering Inclusive growth.

Following the seminal work of Kuznet (1955), several empirical studies have focused on the link between structural change and welfare aspects of an economy such as poverty (Ravallion and Datt, 1996; Khan, 1999; Ravallion and Chen, 2007; Arinquez and Lopez, 2007; Timmer and AKKus, 2008; Suryahadi, Suryadarma and Surmato, 2009; Christieansen, Demury and Kuhl, 2011), and inequality (Bourguignon and Morrisson, 1998; Andersson and Chavera, 2015; Dartanto, Yuan and Sofiyardi, 2017; Baymul and Sen, 2019).

Although several other empirical studies have also followed sooth in examining the mechanics of inequality or indeed other social welfare functions including poverty and employment from the structural economic transformation perspective, only Lavopa, 2015 has focussed on a positive social welfare function as the present study. However, the present study differs from other studies by pioneering a new measure of structural economic transformation via industrial upgrading as well as employing a new social welfare function within the structural-welfare literature. Furthermore, the current study employs the most recent African data in estimating the equity effects of industrial upgrading in Africa with emphasis on country-specific structural heterogeneities.

The rest of the paper is organized as follows; section two explores the literature, section three describes with the data and methodology, section four presents the results and section 5 concludes.

## 2. LITERATURE REVIEW

The theoretical foundations underpinning the concept of structural transformation lies in the heterogeneous nature of the economy. Lewis (1954) in his seminal work showed that at the early stages of development an economy is often characterized by two distinct sectors; the traditional, informal, and rural agricultural sector versus the formal, modern, urban industrial and services sectors. According to him, the former is characteristically backward and of low productivity in nature, and the latter is

progressive and of a higher productivity. He postulates that as capital in the modern economy expands, it absorbs some of the excess supply of labour from the low productivity traditional sector. However, Kuznets (1955) and later Syrquin (1984) further emphasized the sectoral heterogeneities beyond a two-sector model to rather classified the economy into a three broad sectors. The common thread linking both theoretical proposition is the emphasis on the persistence of relative productivity gap and disequilibrium across and within sectors which they argue gives rise to observed variations in factor returns within and across sectors.

In terms of the empirical linkages with social welfare utility function, the literature abounds with several studies highlighting the relationship albeit from largely a common perspective both in terms of operationalizing structural transformation in an empirical analysis as well as the social welfare dimension investigated so far in the literature. Nevertheless, these studies have been able to demonstrate that structural transformation is a very key determinant in improving social welfare particularly with regards to poverty (Ravallion and Datt, 1996; Khan, 1999; Ravallion and Chen, 2007; Arinquez and Lopez, 2007; Suryahadi, Suryadarma and Surmato, 2009; Christieansen, Demury and Kuhl, 2011) and inequality (Bourguignon and Morrison, 1998; Andersson and Chavera, 2015) and to some extent inclusive growth (Lavopa, 2015). Most studies tend to measure structural transformation as the sectoral share of value added in total GDP and share of persons employed in total employment. However, a study by Bourguignon and Morrison (1998), argued that the share of agriculture value added in total GDP was unable to explain differences in income distribution in a cross sectional study of 38 small and medium-sized developing countries using survey data for 1970. The authors argued that the relative labour productivity between non-agriculture and agriculture was superior explainer of income inequality.

Similarly, many studies estimating the relationship between structural transformation and a measure of social welfare have often been fraught with high degree inconclusiveness. For instance, in a panel study comprising 217 countries, Roy and Roy (2017) examined the link between structural change and income inequality and found that structural change adversely impacts income distribution and thus worsening the level of income inequality.

Whereas Ravallion and Chen (2007) in analyzing the effect of structural change on demographic outcomes and inclusive growth found that the primary sector had the most poverty-reducing effect in both rural and urban China. Based on a three-sector model framework, the authors estimated the effect of structural change on rural-urban levels of poverty and inequality between 1980 and 2001 using the growth rates of value-added output shares of GDP on both urban and rural poverty levels in China. The three sectors comprise the primary sector (Agriculture and mining), secondary sector (manufacturing, construction, and utilities) and the tertiary sector (services). In a related study, Datt, Ravallion and Murgai (2016) examined the effect of structural output composition on both rural and urban poverty

levels in India from1951 to 2012. The authors found that whilst only primary and tertiary sectors contributed to poverty reduction in the pre-1990s period, all three sectors contributed to substantial reduction in poverty in both rural and urban areas in the post 1990s period with strong inter-sectoral linkages.

Lavopa (2015) examined the link between the structural change and several indicators of social inclusiveness using Fixed Effects estimation for a panel of 100 countries for the period of 1970-2014. The findings indicate a positive and significant effect of manufacturing on a wide range of social inclusiveness indicators including Non-Poor Ratio[3], Equity Index[4], HDI, etc. Likewise, Baymul and Sen (2018) in separate panel studies focusing on the link between structural transformation and inclusive growth in developing economies found that structural reallocation of labour from agriculture to manufacturing sector decreases income inequality across all countries in the total sample irrespective of the level of economic development. However, the study also found that structural transformation from the agriculture to the services sector worsens income inequality in a sub sample of developing countries with low manufacturing base.

However, besides the literature being inconclusive, most of the studies use measures of welfare that focus on income also suffer from an income-only measure of well-being bias as well as not being necessarily from the perspective of inclusive growth per se (with the exception of Lavopa, 2015). But Lavopa (2015) too only focuses on the manufacturing sub-sectors. Furthermore, most of these studies do not focus on Africa and at best only include a small number of African countries in their sample.

[3] Non-Poor ratio (1-Poverty Headcount)
[4] Equity Index (1-Gini index)

**Table 1. Summary of Structural change-Social welfare empirical literature**

| Study | Social Welfare Function | Estimator | Measure of Structural change | Findings |
|---|---|---|---|---|
| Ahluwalia (1979) | Income Inequality (quantiles) | Homogeneous panel | Value-added (VA) shares in GDP | Agric. negatively significant amongst the bottom 40 % |
| Ravalion and Datt (1996) | Income Poverty | Micro panel India | VA shares per capita | Agric. and Services are negatively significant. |
| Bourguignon and Morrisson (1998) | Income Inequality (quantiles) | Homogeneous panel Fixed Effects | Relative Labour Productivity | Negatively Significant for the bottom 60% |
| Hasan and Quibria (2004) | Income Poverty | Homogeneous panel Fixed Effects | VA shares in GDP | Agric. negatively significant, but industry and services negatively non-significant. |
| Gutierrez et al (2007) | Income Poverty | Homogeneous panel Fixed Effects | Labour shares and Labour productivity | labour-intensive growth in the secondary decreases poverty; labour-intensive growth in Agric. increases poverty but labour productivity in Agric. decreases poverty |
| Suryahadi et al (2009) | Income Poverty | Homogeneous panel Fixed Effects | VA shares in GDP | Services reduces both urban and rural poverty; agriculture reduces rural poverty |
| Loayza and Raddatz (2010) | Income Poverty | Homogeneous panel Fixed Effects | VA shares per capita growth | Manufacturing negatively significant |
| Montalvo and Ravalion (2010) | Income Poverty | Homogeneous panel Fixed Effects | VA shares in GDP | Agric. is positively significant, |
| Christiaensen, et al (2011) | Income Poverty | Homogeneous panel Fixed Effects | VA shares in GDP | Agric. negatively significant for the bottom quantile, Non-Agric. negatively significant for the better-off poor |
| Page and Shimeles (2015) | Income Poverty | Homogeneous panel GMM | Labour shares | Agric. and Services are positively significant, while industry is negative non-significant |
| Lavopa (2015) | Social Inclusiveness (Non-Poor Ratio, HDI, Equity Index) | Homogeneous panel Fixed Effects | Labour shares within Manufacturing subsector | Positively significant. |
| Dartanto et al (2017) | Income Inequality (quantiles) | Homogeneous panel Fixed Effects | VA shares in GDP | Shifts from Agric. to industry and services negatively significant; Also shifts from industry to service negative significant. |
| Roy and Roy (2017) | Income Inequality | Homogeneous GMM | VA shares in GDP | Manufacturing and services positively significant |
| Saha and Ciarli (2018) | Inclusion Index (Wage and salaried workers +Female Labour force participation rate) | Homogeneous Panel Vector Autoregressive model | Structural change index (Labour shares) | positive non-significant. |
| Baymul and Sen (2019) | Income Inequality | Homogeneous Fixed Effects | Labour shares | Shifts from Agric. to Manufacturing negatively significant; while shifts from Agric. to Services positively significant. |

## 3. MODEL AND EMPIRICAL FRAMEWORK

### 3.1. *Estimating the effects of industrial upgrading on inclusive growth*

The effects of industrial upgrade on inclusive development were estimated from three different perspectives. *First*, following a Lewis (1954) styled two-sector model we estimated the effect of modern market upgrade on Inclusive growth. Modern market upgrade was measured as the ratio of modern market activities to agriculture employment. In this model, modern market activities comprise the industrial sector (Manufacturing +Mining and quarrying + Construction + Utilities) and the market services which includes the tradable services (Financial and real estate sector +Telecommunication and transport sector) and non-tradable services (Wholesale, retail trade and distribution + Hotel, restaurant and accommodation). The Agricultural sector comprises (Cultivation + Livestock +Hunting +Forestry and Fishing farming). *Second*, the Inclusive growth effects of the manufacturing upgrade were quantified via three measures, namely; (i) the ratio of manufacturing to agriculture employment (ii) the ratio of manufacturing to non-manufacturing within the industrial sector. *Third*, we quantified the effects of services upgrade on Inclusive growth from two dimensions, namely; (i) the ratio of market services employment to agriculture (ii) and the ratio of tradable services employment to non-tradable.

### *3.2. Assumptions of the model*

We consider a variant of the structural change-social welfare model which is common in the literature (Fields, 2005; Montalvo and Ravallion, 2010; Lavopa, 2015; Baymul and Sen, 2018). Our model modifies for structural industrial upgrading and Inclusive growth. The model is based on the following assumptions:

1. There exist two labour market sectors. The first is the traditional rural agriculture, which has the highest ratio of informal employment, low constant elasticity of substitution of capital to labour results in the lowest mean income. Next, the modern market sector, which comprises all other market activities excluding agriculture and enjoys a higher CES of capital to labour, increasing return to scale production function and consequently higher mean income per sector.

2. The modern market sector is a composite sector comprising several sub-sectors with varying production functions and mean income earnings, namely- manufacturing, non-manufacturing, tradable services and non-tradable services.

3. The manufacturing sector has the highest CES of capital to labour, the highest increasing returns to scale, dynamic economies of scale, higher labour absorbing capacity and higher mean income earnings per sector, while the non-manufacturing sector, although also characterized by high CES of capital to labour, it has low labour absorption rate.

4. The tradable services sector has comparatively higher mean income and high CES of capital to labour but a low labour absorption rate due its high skill labour intensity. On the other hand, the non-tradable

sector is characterised by high informal labour, low CES of capital to labour, a constant return to scale as well as lower mean income earning per sector but higher than agriculture income earnings.

5. The principal agents in this market economy are the private firms and labour force drawn from households. Individuals have the freedom of choices and preferences to engage in inter-sectoral labour mobility in search of higher mean income earnings for the ultimate aim of maximising their welfare (output) proxy by Inclusive growth in this model. The role of the government in this economy is to help households achieve maximum social welfare through an effective implementation of combination of fiscal and monetary policies.

6. Inter-sectoral labour mobility from sectors of low to higher mean income earning is not homogenous across economies but rather heterogeneous and dependent on the stage of economic development. The more developed economies having attained the necessary critical mass, therefore undergoes industrial upgrading via inter-sectoral labour mobility towards the dynamic sectors with higher mean income earning with consequent maximum social welfare for households.

The model specified in an empirical panel framework is a typical Lewis (1954) two sector model and stated as follows:

$$IHD_{it} = \alpha_{it} + \left(\frac{MMS}{Ag}\right)_{it} + X_{it} \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where $IHD$ denotes Inclusive growth, (MMS/AG) is the ratio of modern market sector to traditional agriculture sector denoting the upgrading of the labour from the latter to the former. $X$ is a vector of control variables including government spending and inflation. The subscript *it* refers to the individual countries in the panel framework and the time series of the analysis.

The second aspect of the model specifies two equations with manufacturing as the sector of focus in the Kaldor-Verdoorn tradition (Kaldor, 1957; 1966).

$$IHD_{it} = \alpha_{it} + \left(\frac{Man}{Ag}\right)_{it} + X_{it} \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$IHD_{it} = \alpha_{it} + \left(\frac{Man}{Non-man}\right)_{it} + X_{it} \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where $\frac{Man}{Ag}, and \frac{Man}{Non-man}$ are the relative ratios of manufacturing to the agricultural sector, non-manufacturing sectors respectively. They each denotes industrial upgrading via the reallocation of

labour from the respective lower mean income earning sectors to the manufacturing sector which is assumed to have a higher mean income earning. All other terms remain as in equation (1).

The final aspect of the model species two equations with the services sector at the centre of focus in the theoretical framework of Baumol (1967); Eichengreen and Gupta (2013).

$$IHD_{it} = \alpha_{it} + \left( \frac{Market\_ serviices}{Ag} \right)_{it} + X_{it} \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

$$IHD_{it} = \alpha_{it} + \left( \frac{tradable\_ services}{Non - tradable\_ services} \right)_{it} + X_{it} \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where the ratio of market services to agriculture denotes industrial structure upgrading via the direct inter-sectoral labour mobility from the agriculture to market services. Similarly, the ratio of tradable services to non-tradable services denotes reallocation of labour from latter to the former. All other denotation remains as in equation (1).

## 3.2 DATA OVERVIEW

### *3.2.1 Measuring structural economic transformation*

In the literature, the three most widely employed measures of structural transformation can be categorized into production measures, namely: shares in total employment and value added shares in gross domestic product; and demand measures, i.e. shares in final consumption expenditures (Herrendorf, Rogerson and Valentinyi, 2014, Van Neuss, 2019).

Shares in total employment are either computed based on numbers of persons employed or hours worked per sector- depending on data availability. The shares in value added and final consumption expenditure are typically expressed in nominal prices but can sometimes be expressed in real values[5]. Although a number of studies tend to assume interchangeability of these measures, they are not only unique from each other but they also could sometimes exhibit large quantitative and qualitative differences in empirical estimates especially with regards to the production measures i.e. employment and value added shares. For instance, UNIDO (2012) documented that the Russian Federation and the Indian economy both experienced declines in manufacturing employment despite sustained annual growth in value added between late 1990s to late 2000s. Conversely, over the same period Brazil experienced increases in manufacturing employment in spite of declines value added shares (UNIDO, 2012; Herrendorf, Rogerson and Valentinyi, 2014).

[5] The use of nominal prices is the most common indicator adopted in the literature with the use of real value added deemed controversial due to differences in the treatment of quality changes as well as inflation adjustment in different countries (see Aiginger, 2001; UNCTAD, 2016; Van Neuss, 2019 for detailed discussion).

Following the often divergent trend between value added and employment shares, it becomes necessary to delineate selection criteria in terms of which indicator to adopt in a study. Accordingly, Aiginger (2001) and Nordhaus (2008) have argued that output measures i.e. total output and value added are more suitable for productivity studies. However, beside the relative stability of employment shares over value added shares in GDP, posing a question on the changes in employment composition in the course of economic development would elicit more interest from a social perspective due to their direct linkage to human welfare via labour compensation (Nordhaus, 2008; UNIDO, 2012; Van Neuss, 2018). Since, the current study is an estimation of a social welfare function, employment shares are well-suited as the most appropriate measure of structural change.

*3.2.2. Measuring industrial upgrading*

To measure the dynamic structural shifts to progressive sectors, most studies often employ the shift-share decomposition analysis. A few other studies adopt the Hoffman (1958) indicator of industrial upgrading by measuring the relative importance of any given sector to another, for instance, a decline in the ratio of light to heavy industry indicates industrial upgrading (Chen, Jefferson and Zhang, 2011; Zhou, Zhang and Li, 2013; Tian et al 2014). The strand of structural economic transformation literature that focuses on industrial upgrading and sophistication tend to mostly concentrate on the dynamic shifts along the export and production value chains within the branches of the manufacturing industry. On the other hand, the industrial development literature suggest that the concept of industrial upgrading can also be generally applied to the reallocation of factor inputs and outputs between sectors in what is often referred to as inter-sectoral upgrading (Peneder, 2003; Chuang, 2016). Therefore, the current study adapts the Hoffman (1958) industrial upgrade indicator from a production output orientation (value added shares) to a labour input orientation (employment shares), given the fact that the focus of the study is not a production function but rather on a social welfare function.

**Total employment shares**. The current study obtains annual panel data series on employment shares in total employment from the Groningen Growth and Development Centre (GGDC, de Vries, Timmer and Vries, 2013)'s Africa Sector Database as well as the Extended Africa Sector Database (Mensah and Szirmai, 2018) for a sample of 20 African countries spanning the period from 1990 to 2015. However, whilst the GGDC only provides data for 11 sub-Saharan and 2 North African countries from 1960 to 2010, The Extended Africa Sector Database (EASD) which is an extension and update of the GGDC only provide data for 18 sub-Saharan African countries from 1960s to 2015. The GGDC and the EASD provide the highest quality data available on value-added and employment shares for African countries.

To deal with these limitations, we collected all available data on African countries available in both the GGDC and EASD, which amounted to 20 and updated the dataset to 2017 using the sectoral employment growth rates of International Labour Organisation (ILO) modelled estimates was carried out. ILO modelled estimates are underpinned by employment data from population censuses,

household, establishment and labour force surveys as well as administrative records (de Vries, Timmer and Vries, 2013). Total employment shares in our dataset is defined as the total number of persons employed per sector, therefore consist of all paid employees and self-employed persons as well as family work of 15 years of age and older. The industrial classification based on ISIC revision 3 was adopted as the basis of industrial classification in this study. Table 1 presents the summary statistics for the countries included in our analysis.

However, constrained by the dependent variable data availability, we limited our study to 17 countries (see Table1 for details of the countries).

### *3.2.3 Measuring inclusive growth*

The measurement of inclusive growth is fraught with many contentions, partly, because it is an amorphous term referring to different concepts to different scholars. Some studies have kept it simple by using unidimensional indicator such as poverty, income inequality or the ratio of Gross Domestic Product to persons employed as a measure of social opportunity function often used as proxy for inclusive growth (White and Anderson, 2001; Ravallion and Chen, 2003; Tella and Alimi, 2016). Others have emphasized the multidimensionality in the concept of socioeconomic well-being and inclusivity as a key component of inclusive growth by introducing range of composite indices of basic social services including access to health, education, nutrition as well as per capita income (Kanbur and Rauniyar, 2009; Ranieri and Ramos, 2013).

The present study adopts the latter approach of measuring inclusive growth with a particular emphasis on inequality-adjusted human development index (IHDI) in line with recent studies on inclusive growth (Huang and Quibria, 2013; De Haan, 2015; Asongu and Nwachukwu, 2016; 2017). The IHDI adjusts the Human Development Index (HDI) by discounting the three component dimensions of health and longevity, access to education and decent a standard of living for distributional inequalities because the latter is a national average performance across the population without any inherent distributional consideration. The IHDI is computed using the Atkinson (1970) family of inequality indices (Alkire and Foster, 2010).

**Inequality-adjusted human development index**. Available data for inequality-adjusted human development index (IHDI) only exist from 2010 to 2017 on the UNDP database. However, annual data on the three sub-indices that make up the HDI are available from 1990 to 2017 on the UNDP database. Therefore, we computed a panel of IHDI for 17 out of the 20 African countries earlier mentioned spanning from 1990 to 2017 guided by a detailed manual on how to compute the IHDI obtained from the UNDP statistical database. These sub-indices were discounted for their distributional inequalities using the Atkinson index. Unlike the Gini, the Atkinson index is a dynamic measure of inequality that is sensitive to distribution thus giving more weight to transfers that occur at the tail ends of the

distribution rather than transfers that occur at the middle of the distribution thereby shifting the inequality index towards equality (Alkire and Foster, 2010).

**Household consumption expenditure per capita** annual data series was collected from the UNCTAD statistical database spanning 17 African countries from 1970 to 2017 in constant US Dollar prices and were transformed into per capita amounts by correcting for population size. Household consumption expenditure is defined according to the System of National Accounts classification. It basically entails per capita spending on food and non-food items including household rents, utilities and health as well as spending on clothing, durable goods, leisure and miscellaneous services. It also includes expenditure by non-profit institutions serving households (Lequiller and Blades, 2014).

***Control variables***

In estimating the social welfare function of any phenomenon such as inclusive growth, extant empirical literature often introduce a number of control variables that also impacts social welfare. These include government consumption expenditure, GDP per capita, inflation rate, gross fixed capital formation, the growth of total population, level of financial development, rate of urbanization and degree of trade openness (Sen, 2014; Lavopa, 2015).

However, due to constraints imposed by degree of freedom issues, our core empirical model introduces only three widely used control variables. These are the growth rate of GDP per capita (captures economic well-being); the size of government consumption expenditure (captures fiscal policy effects via government spending on public goods as well as the distortionary effects of taxation); and inflation rate as a proxy for macroeconomic and business environment stability. Nevertheless, this is in line with a number of empirical studies with similar sample size and number of observations (Demetriades and Law, 2006; Montalvo and Ravallion, 2010; Eberhardt, Helmers, and Strauss, 2013).

Moreover, in our robustness check model specification with a larger number of observations, we further address any potential problem of omitted variable bias by introducing gross fixed capital formation as an additional control variable. This control variable is widely reported in the literature of welfare studies (Sen, 2019) because it captures private expenditure capital projects as well as government spending in education, health and transport infrastructure (Lequiller and Blades, 2014).

All control variables were sourced as annual series from the UNCTAD statistical database except the inflation variable, which was sourced from a variety of sources including World Development Indicators, Federal Reserve Bank of St. Louis and the respective central bank statistical databases as consumer price indices. The consumer price indices were transformed into inflation rates by taking the natural logarithmic difference.

**Data limitation**. One of the challenges often encountered in many macroeconomic empirical studies particularly in the developing world usually revolves around data availability and the present study is

no exception. Two issues are worth highlighting here. *First*, issues of missing observations were encountered in the data collection process particularly with regards to consumer price indices. However, we followed extant imputation approach of dealing with missing observations such as moving average to overcome this limitation (Aghion, 2018). *Second*, the small sample size of 17 countries in the core model as well as the small number of observations of 27 years are obviously a limitation particularly due to the fact the family of estimators with group-specific slope heterogeneity which our estimation is based on performs better as $N, T \to \infty$, jointly or when N is fixed (Neal, 2015). We controlled for this limitation by first limiting our number of regressors to the barest minimum within the bounds imposed by degree of freedom. Secondly, since our constraint of small number of observations was imposed by the availability of data on the dependent variable (IHDI). We also introduced another social welfare measure (household consumption expenditure per capita) as a dependent variable for which we have a larger observation (47) as a robustness checks specification. Both the dependent and explanatory variables were expressed into log forms.

**Table 1** presents the **summary statistics** for the different dimensions of industrial upgrade and inclusive growth as well as household consumption expenditure per capita for the individual countries included in the dataset. The summary statistics indicate that Mauritius, Egypt and Morocco have the highest inclusive growth performance at 63, 53 and 47 percentage points respectively. However, in terms of household consumption expenditure per capita; Mauritius, South Africa, Namibia and Botswana registered the highest expenditures at 4,725, 3,773, 2,905 and 2301 US dollars respectively. Conversely, the countries exhibiting the lowest inclusive growth also reported the lowest per capita household consumption expenditure and these countries include Mozambique, Rwanda and Malawi.

In terms of industrial upgrading with regards to the modern market sector, Mauritius, South Africa and Egypt are the most intensive at 750, 330 and 170 percent respectively. On the other extreme, Malawi, Mozambique, Rwanda, Zambia, Tanzania and Uganda each report the lowest modern market upgrade at below 30 percent.

Similarly, the dominance of manufacturing over agriculture follows a similar pattern as the modern market sector with the same top performers, Mauritius and South Africa maintaining their lead while Rwanda, Tanzania and Malawi remain low. In contrast to the previous dimensions, the ratio of manufacturing to non-manufacturing shows a new set of dominance structure with Kenya, Cameroon, Senegal, Ghana and Uganda leading the sample at 350, 280, 250, 240, 230 percentages.

Furthermore, in terms of relative market services intensity over the agriculture sector, the dominant pattern re-emerges with Mauritius, South Africa and Namibia having 380, 190 and 100 percent at the top of the spectrum while Mozambique, Rwanda and Tanzania record the lowest market services upgrade at 10 percent each. Finally, the ratio of tradable to the non-tradable services follows different

trend with Egypt, Namibia, Lesotho, Mauritius and South Africa exhibiting higher intensity of tradable services.

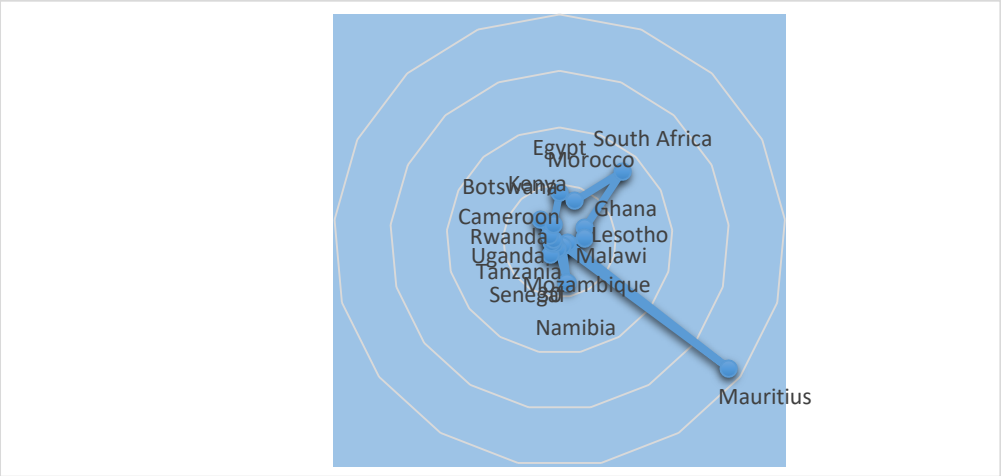


**Figure1.** Average modern market sector intensity from 1991-2017.

Source: Authors computation using GGDC and EAS statistics.

**Figure 1** shows the relative modern market sector upgrade from 1991 to 2017. It illustrates the level of heterogeneities inherent in industrial structural upgrade in the different African economies in almost three-decade expanse of time. The radar chart can be viewed as portraying African modernisation frontier with Mauritius, South Africa and Egypt clearly ahead of the frontier and Malawi, Mozambique and Rwanda below the frontier line.

### 3.3 Estimation Techniques

The study employs the Augmented Mean Group (AMG) estimator introduced by Eberhardt (2012) which is an extension of the Common Correlated Effects Mean Group estimators proposed by Pesaran (2006). There are a number of advantages for adopting the AMG over other panel data models. *First*, it has the ability to control for heterogeneity bias inherent in other homogenous panel models such as Fixed Effects, Generalized Method of Moments and Pooled Mean Group. This is a very important consideration in estimating structural economic transformation given the sound theory and evidence suggesting that developing economies exhibit large structural heterogeneities between and within economies (Syrquin, 1984; Ranis, 2012).

*Second*, it has the advantage of correcting for cross-sectional dependence by eliminating unobserved common factors and filtering individual-specific regressors using cross-sectional averages, which in turn controls for unobservable fixed effects, heteroscedasticity and serial correlation. *Third*, AMG is able to perform consistently in the presence of non-stationary variables regardless of whether the variables are co-integrated or not. *Fourth*, the estimator has been found to outperform other non-

heterogeneous panels in terms of statistical measures of goodness of fit, such as root mean square error and bias under Monte Carlo simulation (Eberhardt, 2012).

However, Pesaran (2006) and Neal (2015) show that Mean Group estimators with heterogeneous slope coefficients are consistent and unbiased as $N,T \to \infty$, jointly. To address the large sample observation requirement of AMG given our relative smaller sample size and observation, the number of regressors were limited to four which is within the range of degree of freedom for meaningful estimation[6].

The methodological principle underpinning the AMG and other Mean Group (MG) estimators is based on two procedures; *first*, estimating the country-specific (firms, states) regressions based on any estimator of choice including ordinary least squares (OLS), Two-stage least squares (2SLS) and GMM. *Second*, averaging the estimated coefficients across individual units (Pesaran, 2006; Eberhardt, 2012; Neal, 2015).

The procedure of the AMG in particular is based on OLS regression and can be summarized in the following equations in line with Eberhardt (2012) and Neal (2015);

$$\mathrm{Y}_{it} = \beta_i \mathrm{X}_{it} + \mu_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$\mu_{it} = \alpha_{1i} + \lambda_i f_t + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$\mathrm{X}_{it} = \alpha_{2i} + \lambda_i f_t + \gamma_i g_t + e_{it} \ldots\ldots\ldots\ldots\ldots (3)$$

Where $Y_{it}$ and $X_{it}$ denotes the observables for the *ith* individual unit at time *t* in the panel. $\beta_i$ denotes the group-specific vector of regressors and $\mu_{it}$ indicates the unobservable group-specific fixed effects $\alpha_{1i}$ represents time invariant unobserved common factor, $f_t$ with heterogeneous factor loading $\lambda_i$, while $\varepsilon_{it}$ and $e_{it}$ denotes the group-specific error terms. The factor loading for the dependent variable as well as matrix of factor loadings for the repressors are indicated in equation (3) as $\gamma_i g_t$

[6] We tried different specifications with several number of regressors and found that at above four regressors, the model ceases to be consistent especially for the heterogeneous coefficients which is the crux of the study.

Table 1. Summary statistics: Inclusive growth and industrial upgrade 1991-2017

| | Inclusive human dev. | | Modern market_ Agriculture | | Manufacturing _agriculture | | Manufacturing _non-manufacturing | | Manufacturing_non-tradable services | | Market services _agriculture | | Tradable services_ non | | Household consumption per capita | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Egypt | 53 | 4 | 170 | 50 | 40 | 4 | 110 | 30 | 100 | 30 | 90 | 30 | 90 | 10 | 1662 | 319 |
| Morocco | 47 | 6 | 150 | 40 | 40 | 10 | 140 | 20 | 90 | 10 | 70 | 20 | 40 | 4 | 1427 | 341 |
| South Africa | 40 | 2 | 330 | 60 | 70 | 10 | 120 | 30 | 60 | 10 | 190 | 40 | 70 | 10 | 3773 | 636 |
| Botswana | 42 | 4 | 100 | 10 | 20 | 2 | 120 | 110 | 50 | 10 | 60 | 20 | 60 | 50 | 2301 | 813 |
| Lesotho | 34 | 1 | 90 | 20 | 20 | 10 | 100 | 30 | 120 | 40 | 40 | 20 | 80 | 20 | 987 | 143 |
| Malawi | 31 | 3 | 30 | 10 | 4 | 1 | 100 | 50 | 40 | 20 | 20 | 10 | 20 | 4 | 429 | 42 |
| Mauritius | 63 | 5 | 750 | 240 | 250 | 30 | 220 | 50 | 140 | 60 | 380 | 180 | 70 | 10 | 4725 | 1357 |
| Mozambique | 24 | 5 | 20 | 3 | 10 | 1 | 30 | 10 | 10 | 4 | 10 | 3 | 20 | 10 | 274 | 69 |
| Namibia | 38 | 2 | 150 | 50 | 20 | 10 | 60 | 10 | 40 | 10 | 100 | 40 | 90 | 20 | 2905 | 925 |
| Zambia | 34 | 5 | 30 | 10 | 5 | 1 | 90 | 20 | 50 | 20 | 20 | 10 | 40 | 30 | 677 | 135 |
| Kenya | 38 | 4 | 60 | 20 | 20 | 10 | 350 | 40 | 80 | 10 | 40 | 10 | 30 | 10 | 717 | 90 |
| Tanzania | 35 | 10 | 20 | 10 | 3 | 1 | 120 | 10 | 30 | 4 | 10 | 5 | 20 | 10 | 378 | 93 |
| Uganda | 32 | 10 | 30 | 10 | 10 | 3 | 230 | 70 | 50 | 10 | 20 | 100 | 40 | 20 | 367 | 75 |
| Rwanda | 28 | 8 | 20 | 10 | 2 | 1 | 80 | 20 | 30 | 10 | 10 | 10 | 30 | 5 | 402 | 104 |
| Cameroon | 36 | 4 | 40 | 10 | 10 | 1 | 280 | 10 | 50 | 10 | 20 | 10 | 20 | 3 | 885 | 82 |
| Ghana | 40 | 40 | 100 | 40 | 20 | 2 | 240 | 70 | 50 | 20 | 60 | 30 | 20 | 2 | 1070 | 331 |
| Senegal | 33 | 4 | 60 | 20 | 20 | 4 | 250 | 30 | 40 | 2 | 40 | 10 | 20 | 2 | 871 | 95 |

Note: All variables are expressed in percentages except household consumption expenditure per capita which is expressed in constant US dollars. For brevity, the statistics for the control variables as well as other non-essential statistics are not reported. SD denotes standard deviation.

## 4. Empirical Results and Discussion

This section presents the results obtained from the empirical analysis of the effect of industrial structural upgrade on inclusive growth. *First*, we present the effects of modern market upgrade on inclusive growth in a Lewis-styled two sector model framework. *Second*, we present the results of the effects of manufacturing sector upgrade relative to agriculture and non-manufacturing industry on inclusive growth in the Kaldorian tradition. *Lastly*, we present results of analysis of the direct transition from agriculture to the market services and its effect on inclusive growth. *Next*, we estimate the effects of tradable market services upgrade relative to the non-tradable.

### *4.1. The effect of modern market sector upgrade on Inclusive growth*

**Table 2** presents the basic result of the model as well as robustness test, while **Figure 2** provides the interpretation in quadrants. The decision criteria for classifying countries into quadrants are based on the combined interpretation of both measures of inclusive growth. Column I regresses the log of modern market sector relative to agriculture (as a proxy for modern market industrial upgrade) on inequality-adjusted human development (proxy for Inclusive growth) while controlling for the log of GDP per capita growth, the log of government consumption expenditure, and the log of inflation rate. Column II is for robustness test of the consistency of our basic model in column I. Column II substitutes dependent variable with household consumption expenditure for an extended period as well as introduces the log of gross fixed capita formation as an additional control variable.

The results of the pooled regression estimates of all countries in the panel suggest a positive but non-significant relationship between industrial upgrade and Inclusive growth. However, the robustness check reveal that indeed the effect is positive and significant.

Furthermore, the results are robust in that countries are clearly either positively significant, negatively significant or both which we classify as *outliers*. *Quadrant I* comprises group of countries with a positive significant effect. All the upper middle-income countries (Botswana, Mauritius, South Africa) in the panel with the exception of Namibia fall into this quadrant. These group of countries are emerging economies with relatively large urban modern sector averaging 332 percent of the market economy as well as a capital-intensive agricultural sector. Similarly, some lower middle income countries (Egypt, Ghana and Lesotho) with a large modern and urban sector averaging 120 percent also exhibit positive relationship with inclusive growth. Conversely, the quadrant also includes all the low income countries (Mozambique, Tanzania, Uganda, Malawi) in the panel except for Rwanda. These groups have the lowest modern urban sector in the panel averaging 24 percent of the market economy yet exhibit a positively significant effect on inclusive growth. This suggest a convergence effect.

However, *Quadrant IV* comprises countries that exhibit a negatively significant relationship between modern market sector and inclusive growth. Namibia, Senegal and Cameroon are the three countries in

this category out of which only Namibia is the odd one being the only upper middle income country in this category. The result suggests that although Namibia is an upper middle income economy, the sources of growth, particularly upgrade into the modern sector is not positively impacting social welfare. This suggest that agricultural sector is rather the source of social welfare improvement

The group of countries asterisked under the quadrant exhibit both positive and negative significance in the two measures of inclusive growth.

| | |
|---|---|
| **Quadrant I: Structural Bonus-Positive Significant**<br>Botswana, Mauritius, South Africa, Egypt, Ghana, Lesotho, Mozambique, Tanzania, Uganda, Malawi | **Quadrant II: Positively non-significant** |
| **Quadrant III: Negative non-significant** | **Quadrant IV: Structural Burden-Negatively significant**<br>Namibia, Senegal, Cameroon |

*__Outliers__: Morocco, Rwanda, Zambia, Kenya

Figure 2. Modern market upgrade

*4.2 The effect of manufacturing industrial upgrade relative to agriculture on Inclusive growth*

**Table 3** presents the basic result of the model as well as robustness tests result. **Figure 3** provides the summary of the results in quadrants. The results in the first is where we regress the log of manufacturing relative to agriculture on inequality-adjusted human development for 1991-2017. In column II we substitute household consumption expenditure per capita as the dependent variable for an extended period as well as introduces the log of gross fixed capital formation as an additional control variable.

The results of the pooled regression estimates of the panel suggest a positive but non-significant relationship between manufacturing relative to agriculture upgrade and Inclusive growth. However, the robustness check reveal that indeed the effect is positively significant.

The results for the individual countries are presented in the quadrants. The decision criteria for classifying countries into quadrants are based on the combined interpretation of both measures of

inclusive growth. The results of *Quadrant I* contain a mix of countries with high manufacturing employment intensity relative to agriculture (Mauritius, South Africa, Egypt) as well as countries with low manufacturing employment intensity relative to agriculture (Botswana, Mozambique, Uganda and Zambia). The large number of countries in quadrant I is indicative of structural bonus taking place in most of the countries in the sample. *Quadrant II* are positive but non-significant and comprises only Ghana and Malawi. Ghana has a low average of 20 percent manufacturing intensity over the period of analysis. As shown in Aryeetey and Baah-Boateng (2015) Ghana rather has a predominantly informal manufacturing employment. This may explain the positive but non-significant result. Malawi on the other hand is plagued by critical mass issue with manufacturing upgrade of 4 percent over the period of analysis.

*Quadrant IV* comprises countries that are experiencing welfare structural burden in terms of manufacturing upgrade from agriculture. These countries include Namibia, Cameroon and Kenya. From the summary statistics, it is obvious that Cameroon has a critical mass issue with 10 percent manufacturing to agriculture ratio suggesting a very large agricultural sector. Kenya and Namibia also have a relatively low manufacturing upgrading of 20 percent each. This suggest that agricultural sector is rather the source of social welfare improvement relative to manufacturing.

*Outliers* are the group of countries under the quadrant figure because they exhibit both positive and negative significance in the two measures of inclusive growth. This group of countries are exhibiting a trade-off effect in favour of consumption over human development as all reporting a robustly negative significance for the relationship between manufacturing upgrade relative to agriculture and inclusive growth, while simultaneously indicating a positive relationship in terms of household consumption expenditure.

| | |
|---|---|
| **Quadrant I: Structural Bonus-Positive Significant** Botswana, Mauritius, South Africa, Egypt, Mozambique, Uganda, Zambia | **Quadrant II: Positively non-significant** Ghana, Malawi |
| **Quadrant III: Negative non-significant** | **Quadrant IV: Structural Burden-Negatively significant** Namibia, Cameroon, Kenya |

***Outliers**: Morocco, Rwanda, Lesotho, Senegal

Figure 3. Manufacturing upgrade relative to agriculture

Table 2. Effects of industrial upgrade from agriculture to modern market sector on inclusive growth

| | IHDI (1991-2017) | Household consumption per capita (1971-2017) |
|---|---|---|
| Pooled effect | 0.039 (0.547) | 0.319 (0.005)a |
| Botswana | 0.243 (0.004)a | 0.501 (0.000)a |
| Cameroon | -0.092 (0.000)a | -0.084 (0.138) |
| Egypt | 0.004 (0.930) | 1.026 (0.000)a |
| Ghana | 0.118 (0.000)a | 0.849 (0.000)a |
| Kenya | -0.216 (0.000)a | 0.042 (0.043)b |
| Lesotho | 0.508 (0.000)a | 0.108 (0.400) |
| Malawi | 0.106 (0.137) | 0.153 (0.025)b |
| Mauritius | 0.036 (0.008)a | 0.768 (0.000)a |
| Morocco | -0.179 (0.000)a | 0.888 (0.000)a |
| Mozambique | 0.590 (0.000)a | 0.346 (0.005)a |
| Namibia | -0.100 (0.000)a | -0.122 (0.009)a |
| Rwanda | -0.118 (0.000)a | 0.197 (0.000)a |
| Senegal | -0.374 (0.103) | -0.391 (0.000)a |
| South Africa | 0.158 (0.000)a | -0.011 (0.899) |
| Tanzania | 0.258 (0.000)a | 0.465 (0.011)a |
| Uganda | 0.155 (0.000)a | 0.081 (0.001)a |
| Zambia | -0.100 (0.049)a | 0.736 (0.001)a |
| Xtcsd. | 2.795 (0.005)a | 4.002 (0.000)a |
| Autocorr. | 189.805 (1.000) | 138.750 (1.000) |
| RMSE | 0.022 | 0.0794 |
| No. Obs. | 459 | 799 |
| No. Countries | 17 | 17 |

Notes: modern market sector is the explanatory variable. All model specifications adjusted for clustered and robust standard errors. P-values reported in parenthesis where a, b and c denotes 1, 5 and 10 percent level of significance respectively. Xtcsd denotes test for cross-sectional dependence while Autocorr denotes serial correlation test.

*Manufacturing upgrade from non-manufacturing industry and Inclusive growth*

**Table 3** presents the basic result of the model as well as robustness tests in columns, while **Figure 4** provides the summary in quadrants. The decision criteria for classifying countries into quadrants are based on the combined interpretation of both measures of inclusive growth. The third column regresses the log of manufacturing relative to agriculture on inequality-adjusted human development for 1991-2017; The last column substitutes household consumption expenditure per capita as the dependent variable for an extended period as well as introduces the log of gross fixed capital formation as an additional control variable.

The results of the pooled regression estimates of all countries in the panel suggest a negative and non-significant relationship between manufacturing upgrade and Inclusive growth in the third column. This negative effect is also confirmed in the robustness model in the last column.

Countries in *Quadrant I* comprises Botswana, Mauritius, Morocco and Uganda exhibit a positive effect of manufacturing relative to non-manufacturing on f inclusive growth and household consumption expenditure per capita. This robust positive effect possibly from the high and rising trend of manufacturing to non-manufacturing ratio. Another factor amongst these countries are that with the exception of Botswana, they do not have large mining sector which tend to dominate the non-manufacturing sector especially in mining-dependent economies.

Countries in *Quadrant IV* contain a mix of countries exhibiting negative significance due to varied reasons; South Africa has a significantly large mining sector, a rising construction sector and a declining manufacturing sector due to de-industrialisation hence the negatively significant effect on inclusive growth. Similarly, Namibia also exhibit a negative significance on social welfare due to the relatively large non-manufacturing sector stemming from mining industry and general low inter-sectoral mobility. Ghana, Tanzania and Zambia also have a dominant non-manufacturing sector stemming from mining as well as a low size and informal manufacturing sector employment which has a low mean income earnings capacity. This suggest that non-manufacture sector is rather the source of social welfare improvement

The *outliers* under the quadrant figure consist of countries exhibiting both positive and negative significant. All the countries in this category with the exception of Egypt and Senegal report a robustly negative significance with inclusive growth measured by inequality-adjusted human development while reporting positive effect on household consumption. Egypt and Senegal however follow the reverse pattern. There appears to be trade-off and preference choices between the two of social welfare for this group of countries.

| | |
|---|---|
| **Quadrant I: Structural Bonus-Positive Significant**<br>Botswana, Mauritius, Morocco, Uganda | **Quadrant II: Positively non-significant** |
| **Quadrant III: Negative non-significant**<br>**Malawi** | **Quadrant IV: Structural Burden-Negatively significant**<br>Namibia, South Africa, Ghana, Tanzania, Zambia |

*__Outliers__: Egypt, Cameroon, Kenya, Lesotho, Mozambique, Rwanda, Senegal

Figure 4. Manufacturing upgrade relative to non-manufacturing

Table 3. The effects of manufacturing industrial upgrade on inclusive growth and household consumption

| | Ratio of manufacturing to agriculture | | Ratio of manufacturing to non-manufacturing | |
|---|---|---|---|---|
| | IHDI | HCEPC | IHDI | HCEPC |
| Pooled effect | 0.055 (0.185) | 0.196 (0.093)b | -0.039 (0.338) | -0.079 (0.420) |
| Botswana | 0.142 (0.109) | 0.305 (0.000)a | 0.144 (0.000) | 0.373 (0.011)b |
| Cameroon | -0.179 (0.000)a | -0.199 (0.062)c | -0.799 (0.000) | 0.188 (0.015)b |
| Egypt | 0.033 (0.266) | 1.181 (0.000)a | 0.057 (0.000) | -0.240 (0.055)c |
| Ghana | 0.078 (0.261) | 0.110 (0.536) | -0.002 (0.908) | -0.297 (0.000)a |
| Kenya | -0.173 (0.000)a | 0.006 (0.781) | -0.185 (0.002) | 0.110 (0.061)c |
| Lesotho | -0.280 (0.000)a | 0.120 (0.033)b | -0.175 (0.000) | 0.116 (0.026)b |
| Malawi | 0.064 (0.235) | 0.014 (0.880) | -0.012 (0.689) | -0.080 (0.100) |
| Mauritius | 0.007 (0.576) | 0.607 (0.000)a | -0.017 (0.127) | 0.528 (0.000)a |
| Morocco | -0.187 (0.000)a | 0.524 (0.000)a | -0.047 (0.347) | 0.309 (0.001)a |
| Mozambique | -0.194 (0.306) | 0.262 (0.000)a | -0.478 (0.000) | 0.210 (0.000)a |
| Namibia | -0.022 (0.503) | -0.279 (0.000)a | -0.171 (0.001) | -0.583 (0.000)a |
| Rwanda | -0.125 (0.000)a | 0.131 (0.000)a | -0.132 (0.000) | 0.071 (0.022)b |
| Senegal | -0.431 (0.000)a | 0.782 (0.000)a | 0.360 (0.001) | -0.528 (0.023)b |
| South Africa | 0.110 (0.008)a | 0.318 (0.006)a | -0.034 (0.233) | -0.024 (0.810) |
| Tanzania | 0.060 (0.053)b | -0.348 (0.041)b | -0.077 (0.005) | -0.137 (0.335) |
| Uganda | 0.148 (0.000)a | 0.067 (0.041)b | 0.148 (0.000) | 0.044 (0.327) |
| Zambia | -0.088 (0.183) | 1.029 (0.002)a | -0.070 (0.000) | -0.542 (0.001)a |
| xtcsd | 26.226 (0.000)a | 6.427 (0.000)a | 44.598 (0.000) | 33.513 (0.000) |
| xtserialpm | 145.897 (1.000) | 81.293 (1.000) | 198.772 (1.000) | 51.285 (1.000) |
| RMSE | 0.0215 | 0.0829 | 0.0204 | 0.091 |
| No. Obs | 459 | 799 | 459 | 799 |
| No. Countries | 17 | 17 | 17 | 17 |

Notes: Both the dependent and explanatory variables were expressed into a log-log functional form. All model specifications adjusted for clustered and robust standard errors. P-values reported in parenthesis where a, b and c denotes 1, 5 and 10 percent level of significance. Xtcsd denotes test for cross-sectional dependence while Autocorr denotes serial correlation test.

*

*4.3 Market services upgrade and Inclusive growth*

**Table 4** also presents the regression results as well as robustness tests in columns, while **Figure 5** provides the interpretation in quadrants. The first column regresses the log of market services relative to agriculture on inequality-adjusted human development for 1991-2017; the second column substitutes household consumption expenditure per capita as the dependent variable for an extended period spanning 1971-2017 as well as introduces the log of gross fixed capital formation as an additional control variable. The slope heterogeneities for members of the panel are presented in a quadrant. The decision criteria for classifying countries into quadrants are based on the combined interpretation of both measures of inclusive growth.

The joint effect of market services upgrade from agriculture for all countries in the panel indicate the existence of a robust and positively significant relationship with Inclusive growth in both the core and robustness model.

The majority of the countries in the panel exhibit a positive and significant relationship between market services upgrade relative to agriculture hence are classified under *Quadrant I.* These countries comprise all of the upper-middle income countries in the panel with the exception of Namibia as well as some of the high performing lower-middle income countries such as Egypt, Ghana and Lesotho. A common factor amongst these economies is the comparatively large market service ratio to agriculture averaging 210 percent for the upper middle income countries and 64 percent. Conversely, the quadrant also includes all but one of the frontier economies with a comparatively smaller market service ratio to agriculture averaging 12.5 percent.

Only three countries exhibit a clear negative significance relationship hence classified under *Quadrant IV*. Namibia is the most persistent of them having negative significance in all previous measures of industrial upgrade. Although, the relation of market services to agriculture for Namibia is quite high, it continues to exhibit a negatively significant relationship with both measures of inclusive growth. However, in terms of Zambia and Cameroon, each averaging low ratios of 20 percent, it clearly obvious that the larger agricultural sector is responsible for the negatively significant relationship. This suggest that agricultural sector is rather the source of social welfare improvement.

The *outliers* under the quadrant figure consist of countries exhibiting both positive and negative significance. All the countries under this category exhibit a negatively significant effect for inclusive growth and a positively significant household consumption per capita with the exception of Senegal which exhibit the reverse by favouring inclusive growth over household consumption. Another factor to consider is that all the countries in this category are lower-middle income except for Rwanda which has persistently reported negative human development with regards to industrial upgrade over the period of analysis.

| | |
|---|---|
| **Quadrant I: Structural Bonus-Positive Significant**<br>Botswana, Mauritius, South Africa, Egypt, Ghana, Lesotho Tanzania, Uganda, Mozambique and Malawi | **Quadrant II: Positively non-significant** |
| **Quadrant III: Negative non-significant** | **Quadrant IV: Structural Burden-Negatively significant**<br>Namibia, Zambia, Cameroon |

*__Outliers__: Morocco, Kenya, Rwanda, Senegal

Figure 5. Market services upgrade

*4.4 Tradable services upgrade and Inclusive growth*

**Table 4** also presents the regression results as well as robustness tests in columns, while **Figure 6** provides the summary in quadrants. The third column regresses the log of tradable services relative to non-tradable services on inclusive growth proxy by inequality-adjusted human development for 1991-2017. Finally, the last column substitutes household consumption expenditure per capita as the dependent variable for an extended period spanning 1971-2017 as well as introduces the log of gross fixed capital formation as an additional control variable. The interpretation of the results of the for individual countries are carried out with the aid of a quadrant. The decision criteria for classifying countries into quadrants are based on the combined interpretation of both measures of inclusive growth.

The results of the pooled estimates of the panel indicate a negative but non-significant effect of tradable services upgrade relative to non-tradable services on Inclusive growth as well as on household consumption expenditure per capita.

*Quadrant I* constitutes countries that show a positive effect of tradable services upgrade relative to non-tradable on the inclusive growth. This quadrant constitutes two group of countries; countries with more developed tradable sector than non-tradable sector such as Lesotho, Botswana, Zambia and Morocco; and countries with small but rising tradable services sector including Rwanda and Cameroon. For the countries in this quadrant, upgrade away from non-tradable services which usually have lower mean income earning potential towards the dominant or rising tradable sector with higher productivity and mean income earnings would stimulate improvement in social welfare as measured by inclusive growth and household consumption per capita.

Table 4. The effects of market services upgrade on inclusive growth and household consumption

| Ratio of market services to agriculture | | | Ratio of tradable services to non-tradable | |
|---|---|---|---|---|
| | IHDI | HCEPC | IHDI | HCEPC |
| Pooled effect | 0.090 (0.082)c | 0.175 (0.085)a | -0.027 (0.431) | -0.040 (0.491) |
| Botswana | 0.167 (0.111) | 0.409 (0.000)a | 0.337 (0.000)a | -0.129 (0.590) |
| Cameroon | -0.071(0.000)a | -0.066 (0.127) | 0.150 (0.000)a | 0.197 (0.051)c |
| Egypt | 0.072 (0.051)b | 0.673 (0.000)a | -0.058 (0.024)a | -0.546 (0.001)a |
| Ghana | 0.092 (0.000)a | 0.754 (0.000)a | -0.092 (0.000)a | -0.080 (0.700) |
| Kenya | -0.234 (0.000)a | 0.042 (0.061)c | -0.189 (0.000)a | 0.013 (0.766) |
| Lesotho | 0.222 (0.000)a | -0.070 (0.498) | 0.016 (0.814) | 0.123 (0.051)c |
| Malawi | 0.316 (0.003)a | 0.071 (0.111) | -0.065 (0.567) | 0.024 (0.684) |
| Mauritius | 0.029 (0.000)a | 0.611 (0.000)a | -0.025 (0.161) | -1.199 (0.000)a |
| Morocco | -0.141 (0.002)a | 0.658 (0.000)a | 0.067 (0.231) | 0.347 (0.007)a |
| Mozambique | 0.522 (0.000)a | 0.073 (0.392) | -0.143 (0.030)b | 0.216 (0.000)a |
| Namibia | -0.092 (0.000)a | -0.11 (0.002)a | -0.089 (0.000)a | -0.251 (0.000)a |
| Rwanda | -0.124 (0.000)a | 0.160 (0.000)a | 0.155 (0.009)a | -0.027 (0.735) |
| Senegal | 0.308 (0.062)c | -0.247 (0.000)a | -0.220 (0.074)c | -0.048 (0.795) |
| South Africa | 0.166 (0.000)a | -0.082 (0.212) | 0.048 (0.032)b | -0.212 (0.000)a |
| Tanzania | 0.301 (0.000)a | 0.487 (0.001)a | 0.018 (0.453) | -0.118 (0.168) |
| Uganda | 0.130 (0.000)a | 0.050 (0.006)a | -0.122 (0.000)a | -0.002 (0.938) |
| Zambia | -0.079 (0.002)a | 0.171 (0.492) | 0.023 (0.101) | 0.374 (0.007)a |
| xtcsd | 1.197 (0.231) | 6.277 (0.000)a | 45.193 (0.000)a | 30.760 (0.00)a |
| xtserialpm | 72.394 (1.000) | 53.729 (1.000) | 598.776(0.000)a | 54.064 (1.00) |
| RMSE | 0.0215 | 0.0811 | 0.0241 | 0.0919 |
| No. Obs | 459 | 799 | 459 | 799 |
| No. Countries | 17 | 17 | 17 | 17 |

Notes: Both the dependent and explanatory variables were expressed into a log-log functional form. All model specifications adjusted for clustered and robust standard errors. P-values reported in parenthesis where a, b and c denotes 1, 5 and 10 percent level of significance. Xtcsd denotes test for cross-sectional dependence while Autocorr denotes serial correlation test.

*Quadrant IV* represents countries with negatively significant relationship between tradable services upgrade and measures of social welfare utility function. Although countries such as Mauritius, Namibia and Egypt are expected to be in Quadrant I due to their high tradable to non-tradable ratios averaging 70, 90, 90 percentages respectively, it is apparent that the non-tradable sector is a very important sector in terms employment generation in these countries and therefore, constitute one of the major sources of social welfare improvement. Furthermore, the large number of countries reporting a negative significant effect is indicative of Baumol's cost disease as well as structural burden hypothesis which states that the non-tradable sector tends to absorb more labour even though the scope of value addition inherent is limited.

The *outliers* under the quadrant figure consist of countries exhibiting both positive and negative relationship. In this category, South Africa and Mozambique both exhibit positive and negative significance albeit opposite of each other. While South Africa exhibit a positively significant effect on inclusive growth, it also exhibits a robustly negative significance on household consumption. Although, South Africa reported negative effect on the expanded time range spanning 1971-2017 throughout the current study, probably due to the apartheid effect, it consistently performed favourably on the inclusive growth measure which basically covers the post-apartheid era. On the other hand, Mozambique reported negative and significant effect on inclusive growth while indicating a positive relationship on household consumption. All the other countries under this category exhibit a positive and negative non-significant effect for both inclusive growth and household consumption per capita.

| | |
|---|---|
| **Quadrant I: Structural Bonus-Positive Significant**<br>Botswana, Lesotho, Morocco, Cameroon, Zambia, Rwanda | **Quadrant II: Positively non-significant** |
| **Quadrant III: Negative non-significant** | **Quadrant IV: Structural Burden-Negatively significant**<br>Mauritius, Namibia, Egypt, Ghana, Kenya, Senegal, Uganda |

***Outliers:** South Africa, Malawi, Tanzania, Mozambique

Figure 6. Tradable services upgrade

## 5. Conclusion and policy recommendation

This paper focuses on the relationship between structural economic transformation and inclusive growth in Africa. The study adopts the Augmented Mean Group estimator to account for the structural heterogeneities inherent in the different countries at different stages of economic development.

Empirical evidence on these dynamic effects are few and far between as most extant studies in the field tend to concentrate more on social welfare deprivation function such as poverty and inequality. Additionally, extant studies tend to measure structural transformation from a rather static perspective as against a more dynamic measure such as relative shares. The result of the current paper suggests an overwhelming evidence of industrial upgrading leading to social welfare structural bonus as in each dimension of structural transformation, majority of the countries seem to be exhibiting a positively significant relationship except for manufacturing ratio to non-manufacturing as well as the tradable services to non-tradable to a lesser extent. An overwhelming trend observed in the data suggest that the upper middle income countries comprising South Africa, Mauritius and Botswana and few high-performing lower-middle income countries including Egypt, Ghana and Lesotho as well as low income countries seem to be the top performers in almost every measure of industrial upgrading. This trend suggest a threshold effect is inherent in the relationship with a logistic and bimodal dimension. Another finding stemming from the analysis is the possible trade-off effect between inclusive human development and household consumption for a number countries prominent among which include Rwanda and Morocco which exhibited a persistent asymmetric relationship between inclusive growth and household consumption.

The policy implication of the current study is obviously country-specific. Persistent low performing countries such as Namibia, Cameroon, Zambia and to a lesser extent Kenya and Senegal should give attention to structural economic transformation due to its wide-ranging implication on social welfare.

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