LISBON SCHOOL OF ECONOMICS & MANAGEMENT
UNIVERSIDADE DE LISBOA

MASTER

DESENVOLVIMENTO E COOPERAÇÃO INTERNACIONAL

MASTER'S FINAL WORK

DISSERTATION

LABOUR PRODUCTIVITY AND EMPLOYMENT LEVELS ON SUB-SAHARAN AFRICA SECTORS. A STRUCTURAL CHANGE PERSPECTIVE (1990-2010).

PEDRO MIGUEL PINHEIRO GONÇALVES

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SUPERVISION:

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Resumo

Esta pesquisa tem como objetivo delinear padrões de mudança estrutural, para o período entre 1990-2010, na Africa Subsaariana. As alterações na estrutura que transfere a mão-de-obra entre sectores e na estrutura da contribuição setorial para o aumento da produtividade do trabalho são analisadas utilizando os dados do Groningen Growth and Development Centre 10-Sector Database, para sete economias da região, através da aplicação de métodos de decomposição.

Os métodos de decomposição permitem um reconhecimento direto da magnitude que as contribuições dos efeitos associados têm nas mudanças das estruturas analisadas, o que permite traçar os respetivos padrões de mudança estrutural.

Os resultados obtidos, indicam que o aumento da produtividade do trabalho na economia deve-se, principalmente, às contribuições dos setores de serviços de mercado, embora uma importância acentuada sobre as contribuições e alocações de recursos deste setor possa estar a limitar as contribuições de outras atividades produtivas e o movimento de trabalhadores entre os vários setores de produção.

Palavras-Chave: Padrões de mudança estrutural, análise sectorial, produtividade do trabalho, nível de emprego, métodos de decomposição.

Classificação JEL: E23, E24, J21, L16, L52, L60, L70, L80, O13, O14

Abstract

This research aims to delineate patterns of structural change, for the period between 1990 and 2010, in Sub-Saharan Africa. Changes on the structure that drives workers between sectors and in the structure of sectoral contributions to labour productivity increases are analysed using data from Groningen Growth and Development Centre 10-Sector Database, for seven economies from the region, through the applying of decomposition methods.

Decomposition methods allow for a straightforward recognisance of the magnitude that contributions from associated effects have in changes of the analysed structures, what ultimately allows to draft the respective patterns of structural change.

The results indicate that the rising labour productivity in the economy is due, chiefly, to the contributions of the market services sectors', although an accentuated importance over this sector contributions and resources allocations may be limiting the contributions from other sectors and the movements of the workforce between the different production activities.

Keywords: Structural change patterns, sectoral analysis, labour productivity, employment levels, change decomposition methods.

JEL classification: E23, E24, J21, L16, L52, L60, L70, L80, O13, O14

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Acronyms and Abbreviations

GGDC	Groningen Growth and Development Centre
GDP	Gross Domestic Product
GDP pc	Gross Domestic Product *per capita*
GVC	Global Value Chain
ISIC	International Standard Industrial Classification
LCU	Local Currency Unit
OECD	Organization for Economic Co-operation and Development
PPP	Purchasing Power Parity
UN	United Nations
UNIDO	United Nations Industrial Development Organization
US	United States
WB	World Bank

1. Introduction

The main question of this research is: what patterns of structural change can be charted from changes in the structure that drives the movements of the workforce between the productive activities and changes in the structure of the sectoral contributions to labour productivity increases, in Sub-Saharan Africa economies.

Structural change paths, patterns and determinants have, for long, constituted core subjects of analysis and debate among several disciplines of economics sciences but its importance and role regarding the socioeconomic development has not been as clear and transparent as one may have thought, however, there is an almost general logical perception of a potential synergic booster, favourable to development, crusted in this kind of processes.

The structural change processes are often described as the shifts of employment from traditional sectors of production to modern ones; i.e., the movement of workers from low labour productivity activities to activities with higher ones. It has always been associated, to a certain extent, with the movement of workers from the agricultural sector to industry[1], namely to the manufacturing activities as these are argued to possess special characteristics related to economic growth (Kaldor, 1967; Szirmai, 2011), thus promoting a structural change of the production patterns and processes associated with a higher product per worker, higher value added of the production and , ultimately, higher incomes per capita (Lewis, 1954; Kuznets, 1973; Kaldor, 1967).

This conceptualization has persisted trough time, spanning from a period two hundred years plus old were it has been applied to describe different processes of shifts and (re)allocations of the workforce into the manufacturing, and more recently market services activities, since the first great take-off in Britain in the 18th century, to contemporaneous movements of workers on developing countries sectoral production structures and its resources compositions shares and changes. Naturally, the challenges that a developing economy faces in reallocating its resources on to more productive sectors changes over time, as do also the paradigms and starting conditions of the process.

[1] The Industry sector is composed by a broad collection of activities that can be subdivided into three specific broad groups: mining, construction and manufacturing activities.

The emergence and proliferation of vertically directed Global Value Chains (GVCs) of production and inherent effort by developing countries not only to become part of them but also to expand and upgrade their positions within the chain of value has developed into one of the most crucial aspects of present days efforts in the quest for a sustained structural change (Kaplinsky and Farooki, 2010; Timmer *et al*., 2015) promoting new chances and challenges to industrial latecomers (Szirmai, 2011; Newman *et al*., 2016). At the same time, the growth of importance of the services sectors in what regards to share and role in the economy in recent decades, for developed and developing economies alike[2], hardens the validity of the proposition adopted by several schools of thought where manufacturing-led growth is treated as a nobler growth than services-led growth, something that the literature and empirical evidences within it also tends to uncorroborated due to a mix of results that redirect the 'nobility' of the experienced growth more to specific and temporal particularities of the economies analysed, the processes followed and, or, the politics adopted (Rodrik, 2009; Newman *et al*., 2016). For developed economies, the process and patterns related to the nature of structural change constitute a well-documented subject of study[3], the same can't be affirmed in what regards to the developing countries given the limitations, feasibility, extension and intrinsic veiled dynamics that these economies, and the data extracted from them, tend to incorporate (Young, 2012; Devarajan, 2013).

The recent efforts by International Organizations, such as the World Bank (WB), and developing countries in collecting and amassing data of several micro socio-economic dimensions, combined with an accentuated practice to elaborate national statistics guided by a more standardized international methodology, have permitted the production of more robust and specific studies on the underlying questions about the industrialization processes in the surveyed economies, UNIDO (2016). The increased awareness and recognition by international organizations and national developing programs that manufacturing production and employment growth are likely to continue to be key components to the development in developing countries (UNIDO, 2016; Martorano *et al*., 2017), has opportunities for capital accumulation and higher productivity can be experienced partial due to the potential socio-economic gains

[2] See Figure.1, pp. 35.
[3] See Syrquin (1988) and Syrquin and Chenery (1989), for works related to the mentioned documentation.

arising from changes in the production structure (Szirmai, 2011; UNIDO, 2016; Diao *et al.*, 2017).

This is the predominant view from a structuralist and development economics view point, the one applied throughout this research, where the patterns of structural change associated with the allocation of the workforce and gains/losses on the overall labour productivity resulting from the patterns that determinate the distribution of the workforce by different economic activities assume a central relevance (Timmer and de Vries, 2009; Timmer *et al.*, 2015; Tregenna, 2013; Rodrik, 2009).

In this research, using Groningen Growth and Development Centre (GGDC) 10-Sector Database[4], two multiperiod accounting models are applied with the purpose to identify patterns of structural change and employment absorption channels of different productive sectors within a selected sample of seven African economies, escaping from the predominant treatment methods that usually shape the economy into two reduced production groups, the modern and the traditional sectors, by focusing on the overall effect that changes in the sectors output levels and resource allocations patterns[5] have in changes of the employment levels of each sector while, simultaneously, addressing the overall contributions of changes in sectors' representative measures to the wide labour productivity.

A decomposition accounting method usually applied to studies on this subject, where the analysis is directed to average labour productivity as it can be potentially modelled as the product of marginal labour productivity and labour share (Mcmillan et al. 2014; Diao et al. 2017), is utilized with an extended formulation that attempts to overcome some of the methods functional constrains.

This analysis is done country wise for the period between 1990-2010, partitioned into four subperiods of identical temporal length, and for a total of five distinct productive sectors grouped form the databases' original presented ten[6].

The current agenda for industrial development from international and national, global, participants is starting to converge both in goals and targets UNIDO (2016); thought, several social, economic and institutional obstacles that passed unchecked in the last

[4] Groningen Growth and Development Centre 10 Sector Database, Available: https://www.rug.nl/ggdc/productivity/10-sector/

[5] Resource allocations will be treated as the inverse of sectors value added share, when analysing sectoral employment levels.

[6] See Table. II; pp. 40.

decades will have to be addressed and, it is almost sure that policy making will have a final word (Newman *et al*., 2016; Martorano *et al*., 2017).

The present section is intended to be a brief glimpse of the investigation work that follows by presenting the research question and the motives underlying the choice of the units of observation. Section.2 reviews the theoretical background on the importance of industrialization and state of the art works about structural change in manufacturing from a structuralist view point, as well critic notes. Section.3 is divided into two sub-sections; Section.3.1 where data and methodology are discussed and Section.3.2 the results are presented and subject to discussion and reflections. In Section.4 final conclusions about the patterns of change are traced and remarks on the limitations of these research are presented. Further research suggestions are also proposed in a final sub-section.

2. Theoretical Background

One of the core concepts in development and growth economics is related to the reallocation of the labour force across the productive activities of the economy that exhibit different productivities; i.e., the resultant output from a unit of all inputs, and technological and input specific needs as well has endowments, Kuznets (1976). Naturally, this process of redistribution over the production structure of the economy turn out to be defined as structural change has different productive sectors rise and fell in their overall importance and contribution for the total employment and output. This definition may be clear to our comprehension from an economic view point, but it is important to note that the concept of structural change is much deeper has it was primarily assembled (in broad concept) and linked (in scope) to the historic processes and struggles of social and economic transformations that brought developed economies, and recently emergent ones, to their presently formalized development stage[7], characterized by historical high, or rising, standards of living (Cypher, 2014; pp.3-31).

[7] The enthralling work of Karl Polanyi (1944) "The Great Transformation", offers a deep insight on the patterns and triggers on European, historical, structural change movements; online: http://inctpped.ie.ufrj.br/spiderweb/pdf_4/Great_Transformation.pdf.

Since the mid of the last century, structural change has become increasingly more associated with the productive dimension of the societies and the movement of workers from the agriculture sector to the industry sector, a process that economists defined as industrialization and, in fact, strongly associated with the previous concept when related to the goods and services production fields. This association between the two concepts isn't at all without a reason, and even persists in recent literature as in Timmer *et al*. (2015); Tregenna (2013) or Rodrik (2009). Has the industry sector, or more concretely the manufacturing activities under it, seem to be endowed with special properties that accelerate growth and income (Kaldor, 1967), because of the embeddedness of the economy in the society the terms tend to be used loosely.

In Szirmai (2011), these special proprieties are traced into several arguments in favour of the hypothesis that industrialization is still a main engine of growth[8], at least for developing countries, anchored on the productivity advantage of manufacturing as well has in its' potential for intense externalities stemming from its growth, although, the empirical evidences wielded in his work are significantly more prone in regard to the developed economies.

Other valuable arguments pro industrialization can also be found in older literature: Lewis (1954) in is contemporaneous review of the classic authors arguments about development and growth, puts capital accumulation on a central stage (as the classics did), but it is his conceptualisation of the circular movement that abnormal profits pulled-out from the modern sector that turns-out to be innovative, where capital accumulation (including knowledge and skills) would promote savings and investment opportunities, as well has the formation of new capital, bolstering income growth and thus also the modern sector one, in a perpetual fashion.

Another important argument in the literature of industrialization is linked to the characteristic spatial concentration of industrial activities as Krugman (1993) exemplifies in is two sector (pedagogic) models of workforce reallocations[9]. Such tendency for concentration promotes the intersectoral physical relations of supply and demand (linkages), and transfers of knowledge and technology in its embodied and

[8] See Kaldor (1967) for the conceptual framework; and Szirmai (2011) for a more extensive discussion.
[9] Krugman's models regard wage growth as result of the productivity bonus of the technologically advanced sector, throwing to oblivion the role that negotiation processes, between pressure groups, are known to have in stipulating wages' growth.

disembodied state (externalities) between different sectors of the economy (Hirschman, 1958; Krugman, 1993). This arises naturally given the high intensity with which manufacturing develops and improves products, new processes and adapts technologies to the production.

In good measure, the arguments and statements reflected on the previous paragraphs are based on empirical evidences and theoretical constructions for developed countries long-run analysis. The thing is, times have changed and the new processes of production partition throughout different regions and activities, doesn't allow for a so straightforward identification of the determinants and patterns of structural change as backed then, Martorano *et al*. (2017). Due to this fragmentation of production, firms and policy makers alike need to understand how to upgrade their insertion on the new vertical chains of production where intermediate goods are the main star. As Kaplinsky and Farooki (2010) made note, the supply capabilities growth isn't just a matter of supply augmentation but ultimately a response to exigencies induced by the demand, conducting firms to a necessary upgrade of their products and processes, as well as to an upgrade in their established function inside the value-chain that can lead, if the capabilities are matured, to a jump into another chain.

In what matters to developing countries expectations and concerns, structural change empirical evidences seem to support the hypothesis that the movement of workers to sectors with higher labour productivities is still an important mechanism for growth as authors from Rodrik (2009), Mcmillan *et al*. (2014), Timmer *et al*. (2015), Diao *et al*. (2017), Martorano *et al*. (2017) or Haraguchi *et al*. (2016) conclude.

The notorious divergence between these authors is the effective role that each of the modern sectors has in bolstering the workforce labour productivity in developing countries. The shock between the manufacturing and market services activities roles in conducting structural change is becoming more pronounced but in Sub-Saharan Africa, gains to labour productivity tend to be more associated to sector internal effects than movement of workers to sectors with higher productivity.

This, for so long, praised nexus between manufacturing growth and economic growth is extremely mixed when contrasted with recent research's. Timmer, M. and de Vries, G. (2009), in their modified shift-shares analysis of individual sectors contribution to growth accelerations over time-windows of fifteen and twenty years, noted an

increasingly intensity from the services sectors as drivers of economic growth. Later, in Timmer *et al*. (2015) the individual contribution from sectors are revisited with an updated and extended database and method that incorporates an interaction term. In this new analysis, the services sectors showed as engines of growth due to their above average productivity and labour-absorption capacity that when comparing with other sectors tended to produce 'static gains' to the overall labour productivity increase when compared with other sectors contributions.

Tregenna (2013), analysis patterns of industrialization for 28 countries, using the conventional definition of the concept: manufacturing employment share growth in total employment and focusing exclusively on the manufacturing sector employment dynamics absorption. Her investigation reveals that manufacturing value added and labour-intensity tend to follow separate ways of behaviour. This is an important and present problem in analysing structural changes given that defining deindustrialization by the conceptual framework may not be appropriate, after all, if sectoral employment is falling while the sectors' value added share is growing the process cannot logically be viewed as deindustrialization, at least, by the standard definition of the concept. Similarly, if the employment share rises and value added share doesn't change, are we in the presence of a structural change? An important concept that emerges from Tregenna (2013) analysis is the 'premature deindustrialization' one, where developing countries start to lose jobs in manufacturing at income levels well below the ones experienced by developed economies when the patterns of workers allocation from agriculture to industry; shifted from agriculture and industry to market sectors Mcmillan *et al.* (2014).

This concept of 'premature deindustrialization' is posteriorly worked by Rodrik[10], and by a simultaneous analysis of three different measures of deindustrialization that are common on the literature of reference to this matter[11]. His findings suggests' that developing countries are following a growth path detached from a fast-paced industrialization, given that the process doesn't claim to possess the virtues of other times.

[10] See Rodrik (2015).
[11] The three measures applied in Rodrik (2015) are: Manufacturing real value added, manufacturing nominal value added and Manufacturing employment share.

In the same line of thought, but with different methods, Diao *et al*. (2017) reaches the same conclusion expressed in Rodrik (2015) by applying a modified model from Timmer *et al*. (2015). Notably, in conclusion, the role that productivity growth in the agriculture sector of some African economies has, is much more pronounced than traditional dualist models preached. This result isn't of a lesser importance; however, it shouldn't mean or imply the downfall of the manufacturing as an engine of growth, but the selection of weights in is decomposition model are known to overestimate the contribution of the effects.

Haraguchi *et al*. (2016), using a very extensive data set, argues' and empirically shows' that manufacturing is still of vital importance to developing countries growth and catch-up, but the manufacturing activities are becoming more concentrated in a very small number of highly populated countries. This evidence, according to the authors, is mainly due to the relative inability of some countries to develop and reinforce the domestic manufacturing activities, because the availability of resources can only afford to be directed at specific industrial activities or at the ones that produce higher returns, such as the tradable sectors or market sectors for services linked to tourism.

From the reviewed literature and from a structural perspective, four factors step forward as channels for the absorption of increases in the levels of the workforce employed in the different productive activities: (1) the economy wide labour-intensity, as it reflects overall constrains in the labour-absorption capacity at an aggregate level or income distribution inefficiencies; (2) the labour share of each sector due to its sensible reaction to output increases and upgrades on sectors intrinsic matching qualities between employers and employees; (3) sectoral output improvements and resource displacements, relatively to the country average, between them and (4) Output as a measurement of the transformation capacity that the technology used has in generating income [12].

Now, we are confronted with an important question: How to measure the structural change?

From the theoretical and empirical review several methodological constructions can be identified, but three specific methods come into the light: econometric methods, powerful in discovering and measuring the determinants and externalities effects and

[12] See OECD (2001).

impacts on structural change (Haraguchi *et al*., 2016; Martorano *et al*., 2017); input-output analysis that produces technical coefficients on the backward and forward linkages between sectors of the economy; and, accounting methods to decompose overall contributions (Tregenna, 2013; Timmer *et al*., 2015; Diao *et al*., 2017)[13]. Due to this multitude of techniques, the definition of the goal and purpose of the investigation are of the utmost importance has they all have flaws and virtues, despite their complementary nature.

As presented in the previous section, the goal of this investigation is tied with the overall contributions to the wide labour productivity emerging from productive sectors and trough the reallocation of workers within them. For this reason, an accounting decomposition model will be applied in the next section, but before that some lines should follow regarding the accounting decomposition techniques.

The accounting technique primary interest is to segregate the changes in the factors that are displayed in a confounding manner into their overall contribution to the change in size of the studied dimension. Decomposition analysis can be traced to the original works produced, in the first half of the last century, by Wassily Leontief, also pioneer of the input-output analysis. Since then, decomposition techniques have been extended, modified and perfected. Notable contributions for these methods can be found in the works of Oosterhaven and Hoer (1997) where they developed the polar-decomposition mechanics, Timmer and de Vries (2009) and the modified shift-share analysis, as well Timmer et al. (2015) for additional extensions, Tregenna (2013) by her mid-points variation analysis, among others.

[13] There are also combinatory methodologies of the three presented. Polar Decomposition between input-output analysis and decomposition accounting, see Oosterhaven, J. and Hoer, A. (1997); regression decomposition in a similar way to the Blinder-Oaxaca decomposition, see Oaxaca (1973) and Blinder (1973), among others.

3. Empirical Analysis

3.1. Data and Methodology

Data are draw from the Groningen Growth and Development Centre 10-Sector Database[14], which provides data on employment levels and output levels, at current and constant local currency units (LCU's), for ten production sectors and covers eleven countries from the Sub-Saharan Africa region. The 10-Sector Database is the first to present comparable and annual sectoral data, over an extended period, for a vast selection of countries allowing for international comparability of labour productivity changes of different production sectors. The sample for analyse consists of seven African countries: Nigeria, Ghana, Kenya, Senegal, Zambia Malawi and Tanzania, they are all developing countries from Africa Sub-Saharan region. Table I, bellow, synthetizes some of the sample details.

Table I – Countries details, per capita Gross Domestic Product and Population % variation (1990-2010).

Country	UN code	Region	Income Group	GDP pc	Population
Nigeria*	NGA	West Africa	Low middle income	69,33%	66,45%
Ghana	GHA	West Africa	Low middle income	59,38%	67,57%
Kenya	KEN	East Africa	Low income	4,01%	76,69%
Senegal	SEN	West Africa	Low middle income	18,38%	70,95%
Zambia	ZMB	South Africa	Low middle income	40,02%	72,54%
Malawi	MWI	South Africa	Low income	38,80%	60,71%
Tanzania	TZA	East Africa	Low income	41,97%	81,07%

Source: Adapted from United Nations (2014).
Data: World Bank – World Development Indicators, 2018.
Notes: GDP per capita values are directly extracted from the WDI Database. The values do not coincide with the GGDC 10-Sector Database due to different construction lines. GDP per capita is in 2011 PPP dollar used by the WB in data construction. Countries with * sign, are classified by United Nations (2014) as fuel-exporting countries; pp. 147.

The distribution of value added and employment levels over five distinct economic activities: Agriculture, Manufacturing, Other Industries, Market Services and Non-Market Services. The ten sectors on the database were constructed following ISIC

[14] Groningen Growth and Development Centre 10 Sector Database, Available: https://www.rug.nl/ggdc/productivity/10-sector/

Rev.3.1[15] sections classification, allowing for a further aggregation of the production sectors as Table II on pp. 40, shows.

Each of the five established sectors output is measured in 2005 local currency units (LCU) obtained through the accounting of a known proxy, value added, measured from several international and national data sources and built respecting three checks of consistency to turn internal, international and over time comparations between economies and sectors feasible[16].

Since the comparative statics produced in the decomposition are to be analysed between specific geographical regions it is necessary to use sectoral price indices so that the obtained effects are meaningful. As stated by Timmer *et al*. (2015), the use of the sectoral output prices provided by Inklaar and Timmer (2013)[17] to regularise relative output price changes between different sectors outputs and income changes as well, promotes better international comparisons of labour productivity evolutions and structural change patterns.

Sectors outputs are converted, from constant 2005 national prices, to assure compatible aggregation between countries weighting each sectors' output by the corresponding sectoral purchasing power parities (PPP) indices and defining the technological frontier as the United States so that all countries on our sample are analysed regarding the same scale of observation. Total output is then aggregate from the sectors standardize values so aggregation of sectoral outputs and employment levels onto larger constituent production activities of the economy. Sectoral PPPs drawn from Inklaar and Timmer (2013) are compatible with the 10-Sector Database data for Sub-Saharan African countries what ultimately will allow for a direct combination of these data sets.

The use of these relative sectoral output prices indices control for the effects that the variability of relative prices across sectors can impose and, by projecting these values into 2005 US dollar prices, a finer analysis becomes admissible with the control for income levels changes, internationally, since a fixed observation and technological frontier standard has been defined. Ultimately, we can access economy-wide and sectoral-wise output and labour productivity comparable and feasible measurements of

[15] See UN (2002) for further and extended details on ISIC Rev.3.1 construction parameters.
[16] See de Vries, G. *et al.* (2015), for deeper details about the database.
[17] More detailed information on Inklaar and Timmer's (2013), sectoral output prices as well as the PPPs data set, are available at: https://www.rug.nl/ggdc/productivity/10-sector/other-releases/africa-sector-database.

variation between all countries and sectors in our sample. Values will be expressed in 2005 PPP US dollar throughout this work, unless otherwise stated, they were computed as:

$$\text{VA\_sector\_}i\text{\_}_{2005\text{pppUS}} = \frac{\text{VA\_sector\_}i\text{\_}_{2005\text{LCUs}}}{(\text{exchange rate} * \text{sector\_}i \text{ price level})}$$

Some words on data reliability are due and presented in the following paragraphs. Output and employment estimates and measurements have been subject to remarkable regards, particularly in African countries, due to broad errors in measurement, as pointed by Young (2012) and by Devarajan (2013), that can easily misrepresent the conclusions of any analysis.

Young (2012) denotes a serious and fundamental problem in the production of historic estimates of income and standards of living in the poorest countries that undermines the production and analysis of the development paths and related intensities. Relaying on more consistent produced time-series from the Demographic and Health Survey to investigate the evolution of the real (material) household consumption in sub-Saharan Africa, Young results show that the consumption is on par with other economies of the World, contradicting the reported internationally data sources such as the ones from the UN.

In Devarajan (2013) population and product statistics are put in the limelight as they are often accounted using outdated methodologies, or politically motivated ones[18], that can undervalue these components as exposed in Ghana and Malawi cases, this discrepancy ultimately leads to an overvaluation of the development performance.

The use and aggregation international and national data sources in order to estimate long and consistent series elaborated through standardized international guidelines, allows to control some of the shortcomings in the use of some of the reported international data sources as pointed in de Vries *et al*. (2015), unfortunately, it isn't without a penalty in presence of a weak representability of the population in study or on

[18] Devarajan (2013) states that in Nigeria, population head-counts tend to be overstated has they affect the fiscal transfers to the federation states.

the presence of, relatively large, competing and complementary unaccounted structural groups.

The measurement of the labour input in 10-Sector Database falls on the broader definition of persons employed considering both formal and informal workers, as well self-employed. The definition and measurement of this input isn't consensual since it's difficult to surpass different conceptual bases for modelling the qualitative natures of workers, nonetheless, it´s a widely accepted procedure to account for the total number of hours worked, per year, in the economy (OECD, 2001; pp.39-41).

This constitutes a clear limitation from the 10-Sector Database as it, chiefly, counts on population census for sectoral employment levels and labour force surveys to draw trends and fitted values in between. A reimbursing component on the use of this broader data set when analysing sectoral labour productivity contributions and inherent employment absorption channels is that a sharper dynamic of the reallocation mechanics may be captured and compared under the three consistency checks, previously pointed.

For our sample of countries, no major discrepancies were detected in the data. All countries experienced a positive growth on the overall number of workers, but at the sectoral level it must be mentioned that in Malawi aggregate value added almost doubles between 2005 and 2010, a phenomenon that may well be linked to the strengthening of national statistical departments and methodologies applied, as Devarajan (2013) and Young (2012) exposed. There is a break in the series for the employment level in the government services sector for Zambia, as this analysis aggregates the community, social and personal services with the previous sector to aggregate two distinct sectors representing market and non-market services, the measurements of productivity variation between time poles will not reflect adequately the contributions of the non-market services sector to the overall changes of labour productivity.

Agriculture, manufacturing and market services sectors patterns of change will receive the bulk of the attention in this investigation, as these are the original production branches where structural change interactions unfold.

The sectoral employment absorption channels are analysed by a decomposition method expanded from the one applied by Tregenna (2013) to investigate changes in

manufacturing employment levels, internationally, arising from sectoral changes of output and labour-intensity. The use of the sectoral labour-intensity to access the capacity to absorb workers in a multi-sector analysis wouldn't regard the dynamics of the economy productivity or the sectoral variations of the labour share as these may fall even if the sectoral employment level rises.

To surpass such limitation when analysing multiple sectors, we replace the component pertained to the absorption capacity presented in Tregenna (2013) by the interaction between the sectoral variations of the labour share and the economy labour-intensity changes. This modification, thus, allows for a more interactive analysis of the sectoral labour-absorption capacity and for a more concrete observation of the role pertained to the sectors dynamism in expanding their own employment levels', as the sectoral dynamism is now analysed by output and by the relative output shift between the sectors of the economy.

The method is applied for the following five years intervals, 1990-1995, 1995-2000, 2000-2005 and 2005-2010.

The decomposition is derived from the initial identity:

$$\theta_{jt} = \sum_{i=1}^{n} L_{ijt} = \sum_{i=1}^{n} \lambda_{ijt}\gamma_{ijt}\delta_{ijt}\rho_{jt}$$

Let $L_{ijt,}$ be the employment level of a given sector *i* over a defined geographical region *j* at the time *t*, in this research $n = 5$ as the *i* sectors are analysed for each of the seven selected countries[19], and θ_{jt} the economy employment level, the sum of all productive activities contained in country *j* so at specific time *t* that the $\theta_{jt} = \sum_i L_{ijt}$. By defining O_{ijt} as the output of sector *i*, in economy *j* at moment *t*, the total output for the economy can be obtained as $O_{jt} = \sum_i O_{ijt}$. For any specified sector *i*, its inverse output share is defined as $\left[\lambda_{ijt} = \frac{O_{jt}}{O_{ijt}}\right]$, the labour share as $\left[\gamma_{ijt} = \frac{L_{ijt}}{L_{jt}}\right]$, the output level of sector *i* $[\delta_{ijt} = O_{ijt}]$ and, the overall labour-intensity of the economy as $\left[\rho_{jt} = \frac{L_{jt}}{O_{jt}}\right]$.

[19] Different grouping categories could be constructed accordingly to the specificities of the analyse. The index *j* could easily be reformed into regions or sectors' specific groupable dimensions.

To account for the overall effect that changes in the identity factors produce in the employment levels for two time-poles [*t*;*t+h*] leads us to rewriting the identity as a difference of the variation of its components for both time-poles, so that:

$$\Delta\theta_j = \sum_i L_{ijt+h} - L_{ijt} = \sum_i \lambda_{ijt+h}\gamma_{ijt+h}\delta_{ijt+h}\rho_{jt+h} - \lambda_{ijt}\gamma_{ijt}\delta_{ijt}\rho_{jt}$$

The following step is to decompose this variation identity into an addictive structure that interacts each of the factors changes with a three-partied structure of the remaining complementary factors variation mid-points. The result is the below identity structure for the overall changes in the mid points. Additional methodological explanations can be found on the Appendix, pp. 32.

$$\Delta\theta_{ij} = \lambda_{ijt+h}\gamma_{ijt+h}\delta_{ijt+h}\rho_{jt+h} - \lambda_{ijt}\gamma_{ijt}\delta_{ijt}\rho_{jt}$$

$$= (\lambda_{ijt+h} - \lambda_{ijt})\left\{\left(\frac{\gamma_{ijt+h}\delta_{ijt+h}\rho_{jt+h} + \gamma_{ijt}\delta_{ijt}\rho_{jt}}{8}\right) + \frac{1}{12}\left(\left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{2}\right)\left(\frac{\delta_{ijt+h}\rho_{jt+h} + \delta_{ijt}\rho_{jt}}{2}\right) + \left(\frac{\delta_{ijt+h} + \delta_{ijt}}{2}\right)\left(\frac{\gamma_{ijt+h}\rho_{jt+h} + \gamma_{ijt}\rho_{jt}}{2}\right) + \left(\frac{\rho_{jt+h} + \rho_{jt}}{2}\right)\left(\frac{\gamma_{ijt+h}\delta_{ijt+h} + \gamma_{ijt}\delta_{ijt}}{2}\right) + 6\left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{2}\right)\left(\frac{\delta_{ijt+h} + \delta_{ijt}}{2}\right)\left(\frac{\rho_{jt+h} + \rho_{jt}}{2}\right)\right)\right\} +$$

$$(\gamma_{ijt+h} - \gamma_{ijt})\left\{\left(\frac{\lambda_{ijt+h}\delta_{ijt+h}\rho_{jt+h} + \lambda_{ijt}\delta_{ijt}\rho_{jt}}{8}\right) + \frac{1}{12}\left(\left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{2}\right)\left(\frac{\delta_{ijt+h}\rho_{jt+h} + \delta_{ijt}\rho_{jt}}{2}\right) + \left(\frac{\delta_{ijt+h} + \delta_{ijt}}{2}\right)\left(\frac{\lambda_{ijt+h}\rho_{jt+h} + \lambda_{ijt}\rho_{jt}}{2}\right) + \left(\frac{\rho_{jt+h} + \rho_{jt}}{2}\right)\left(\frac{\lambda_{ijt+h}\delta_{ijt+h} + \lambda_{ijt}\delta_{ijt}}{2}\right) + 6\left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{2}\right)\left(\frac{\delta_{ijt+h} + \delta_{ijt}}{2}\right)\left(\frac{\rho_{jt+h} + \rho_{jt}}{2}\right)\right)\right\} +$$

$$(\delta_{ijt+h} - \delta_{ijt})\left\{\left(\frac{\lambda_{ijt+h}\gamma_{ijt+h}\rho_{jt+h} + \lambda_{ijt}\gamma_{ijt}\rho_{jt}}{8}\right) + \frac{1}{12}\left(\left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{2}\right)\left(\frac{\gamma_{ijt+h}\rho_{jt+h} + \gamma_{ijt}\rho_{jt}}{2}\right) + \left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{2}\right)\left(\frac{\lambda_{ijt+h}\rho_{jt+h} + \lambda_{ijt}\rho_{jt}}{2}\right) + \left(\frac{\rho_{jt+h} + \rho_{jt}}{2}\right)\left(\frac{\lambda_{ijt+h}\gamma_{ijt+h} + \lambda_{ijt}\gamma_{ijt}}{2}\right) + 6\left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{2}\right)\left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{2}\right)\left(\frac{\rho_{jt+h} + \rho_{jt}}{2}\right)\right)\right\} +$$

$$(\lambda_{ijt+h} - \lambda_{ijt})\left\{\left(\frac{\lambda_{ijt+h}\gamma_{ijt+h}\delta_{ijt+h} + \lambda_{ijt}\gamma_{ijt}\delta_{ijt}}{8}\right) + \frac{1}{12}\left(\left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{2}\right)\left(\frac{\gamma_{ijt+h}\delta_{ijt+h} + \gamma_{ijt}\delta_{ijt}}{2}\right) + \left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{2}\right)\left(\frac{\lambda_{ijt+h}\delta_{ijt+h} + \lambda_{ijt}\delta_{ijt}}{2}\right) + \left(\frac{\delta_{ijt+h} + \delta_{ijt}}{2}\right)\left(\frac{\lambda_{ijt+h}\gamma_{ijt+h} + \lambda_{ijt}\gamma_{ijt}}{2}\right) + 6\left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{2}\right)\left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{2}\right)\left(\frac{\delta_{ijt+h} + \delta_{ijt}}{2}\right)\right)\right\}$$

The overall contribution from changes in the four components that explain the overall sectoral employment absorption channels can now be written as:

$$\Delta\theta_j = \sum_i L_{ijt+h} - L_{ijt} = \sum_i \lambda'_{ij+}\gamma'_{ij+}\delta'_{ij+}\rho'_{ij}$$

Where the apostrophes are indicative that the corresponding variables are now turned into a group of addictive effects.

The overall variation of the employment level, at sectoral level, can now be explained by four different contributing effects that imply very distinct forces. A decrease on the total labour-intensity can indicate that the economy, in its all, is struggling to distribute workers and generate income, for a given sector, such phenomenon is expected to produce different magnitudes accordingly to the other factors variation. At the same time, an increase of relative displacement of resources from a sector, measured by the inverse output share, combined with a positive sector growth effect may not constitute a deep problem if the output generated by each worker continues to rise. It may also suggest an attempt to substitute the lost productive resources by other productive patterns, more labour-intensive, or represent a misplacement of resources between economic activities in the efforts to keep the output growth.

By the same order of thought, a negative contribution from the resource displacement effect would suggest that the sectors capacity augmented and, provided output continues to increase, the capacity to engross employees do augments which is completely different process than the one followed by the need to alter the productive pattern. As the effects alter in a compensatory fashion of the remaining components variations, it is prudent to analyse them, at the sectoral level and regarding the sectoral labour productivity evolution[20].

The effects of the sectors labour share are strongly associated with frictional and mismatching opportunities in the employment market, as well rigidity of workers movement at the sectoral level, as a shrinking share do not imply lower absolute levels in the presence of constant employment growth and sectoral output expansions. They do, however, imply additional absorption constraints on the arrays of the production activities that, when combined with the effects of the other factors can suggest important patterns in labour movements between sectors.

[20] See Figure.3, figures 3a) to 3g), pp 37-38.

At the sectoral level, the analysis of the wide labour-intensity becomes less pertinent given that its value is static across all the activities[21], as it was resounding across the other effects values. To refine the results from the decomposition, the contribution of the labour-intensity effect is discounted from the other effects individual contributions[22] for each sector so that information about the other effects isn't lost keeping it possible to uphold the saturation and consistency[23] of the method and present scaled, cleaner results.

Next, to have a clear insight on contributions to overall productivity from each sector, we apply a decomposition method used, in different variants, on part of the literature revised, but allow him to have an interaction term that poses no impact at the aggregate level. Previous works like Mcmillan *et al*. (2014), Timmer *et al*. (2015) or Diao *et al*. (2017) apply a model that decomposes gains to total productivity arising from internal sources at sectoral level and from the movement of workers into sectors of higher productivity. The models applied by Mcmillan *et al*. (2014) and Diao *et al*. (2017), have the inconvenience of leaving the time weighting parameters, of the two-time poles, to a seemingly arbitrary choice and Timmer *et al*. (2015) variant extends the previous models by introducing a dynamic element that, in the end, hardens the interpretation of the results.

The model applied in our research surpasses the time weighting parameters constrain by using as time weighting parameters the average of the ones available at each of the times' poles, a known method for surpassing such problem. An interaction term is added allowing to extend the analysis to changes on the output share of the sector, naturally it doesn't have any effect on the total aggregate but as volume and price of production change, effects on the distribution of the shares affect each sector as a representative nature of the prioritisation given, and degree of keenness acquired, to resource flows from one sector to the others. In the model, no hierarchy relation between components effects will be delineated and value added shares relative contributions will be treated as direct transfers to the overall sectoral contribution.

[21] The value is static over the sectors but it's effect isn't.
[22] For any period, the labour-intensity effect is a proportion of the sectors labour variation, so the other effects can be scaled by $[1/(\Delta L_{ij}/\rho'_{ij})]$.
[23] The model doesn't lose information so in the end the sum of the components must be exactly equal to the variation they explain.

The model comes from the identity:

$$2\frac{Q_{jt}}{L_{jt}}=\sum_{i=1}^{n}\frac{Q_{ijt}}{L_{ijt}}\frac{L_{ijt}}{L_{jt}}+\sum_{i=1}^{n}\frac{Q_{ijt}}{Q_{jt}}\frac{Q_{jt}}{L_{jt}}$$

Where $\frac{Q_{jt}}{L_{jt}}$ is the country *j* average labour productivity at time *t*, $\frac{Q_{ijt}}{L_{ijt}}$ is the sector *i* average labour productivity, $\frac{L_{ijt}}{L_{jt}}$ the labour share of sector *i*, $\frac{Q_{ijt}}{Q_{jt}}$ the output share of sector *i* and *n* is the number of sectors in the economy. Each of the previous defined components, will have a specific contribution on the economy average labour productivity. thus, if we decompose the above identity between two moments in time [*t*;*t+h*], we obtain:

$$2\Delta\frac{Q_{jt}}{L_{jt}}=\sum_i\left(\frac{Q_{ijt+h}}{L_{ijt+h}}-\frac{Q_{ijt}}{L_{ijt}}\right)\frac{\overline{L_{ijt}}}{L_{jt}}+\sum_i\left(\frac{L_{ijt+h}}{L_{jt+h}}-\frac{L_{ijt}}{L_{jt}}\right)\frac{\overline{Q_{ijt}}}{L_{ijt}}+\sum_i\left(\frac{Q_{ijt+h}}{Q_{jt+h}}-\frac{Q_{ijt}}{Q_{jt}}\right)\frac{\overline{Q_{jt}}}{L_{jt}}+\sum_i\left(\frac{Q_{jt+h}}{L_{jt+h}}-\frac{Q_{jt}}{L_{jt}}\right)\frac{\overline{Q_{ijt}}}{Q_{jt}}$$

Where the – sign over the components, refers to their average over period *h.*

Given that $\sum_i\left(\frac{Q_{jt+h}}{L_{jt+h}}-\frac{Q_{jt}}{L_{jt}}\right)\frac{\overline{Q_{ijt}}}{Q_{jt}}=\Delta\frac{Q_{jt}}{L_{jt}}$ the above decomposition can be rewritten as:

$$\Delta\frac{Q_{jt}}{L_{jt}}=\sum_i\left(\frac{Q_{ijt+h}}{L_{ijt+h}}-\frac{Q_{ijt}}{L_{ijt}}\right)\frac{\overline{L_{ijt}}}{L_{jt}}+\sum_i\left(\frac{L_{ijt+h}}{L_{jt+h}}-\frac{L_{ijt}}{L_{jt}}\right)\frac{\overline{Q_{ijt}}}{L_{ijt}}+\sum_i\left(\frac{Q_{ijt+h}}{Q_{jt+h}}-\frac{Q_{ijt}}{Q_{jt}}\right)\frac{\overline{Q_{jt}}}{L_{jt}}$$

The first term, on the right side, is known as the intra component expresses the contribution to the labour productivity from sectoral internal sources, the second component is the structural effect that measures the gains arising from the movement of workers between activities of higher labour productivity. The third component is neutral at the aggregate level and dynamic at the sectoral one as it will depend of the relative prices of each sector output to reflect shifts of resource, preferences or even delineated policy choices. To note that, relative shifts of resources, output share changes, can result from direct policy interventions as to modify sectoral prices, through well-known mechanisms.

3.2. Results and Discussion

The decomposition models applied are extended from the theoretical scope, to investigate the questions of importance of this research, the patterns of structural change trough the labour-absorption channels of the productive sectors and gains to productivity arising from the shifts in the labour productivity and labour share of each sector, that are associated with the changes on the sectoral output growth and in the relative allocation of workers in the economic activities of the seven countries selected. In the expanded method we apply, the changes on sectoral employment levels are analysed for all the defined sectors and further explained by the overall variations of the sectors relative resources displacements, the sectors' labour share, sectors' output and the economy labour-intensity[24]. The detailed results of the decomposition for the five sectors is showed on Table III; pp 41, and for aggregates of all countries Figure 2 (from Figure.2a) to Figure2.g)) shows the results; pp 36.

The results seem overall consistent with the initial expectation that the sector growth effect [δ'_{ijt}] would represent the bulk of employment absorption at an aggregate level as Figure.2, page 36, resumes. The surprising evidence is the contribution of the resources displacement [λ'_{ijt}] on the overall channelling of labour in Zambia for the two last periods, from 2000 to 2010. The effect of resources displacement that reflects the rearrangement of sectoral outputs, of different prices, inside the economy assumes the role of sector growth effect in Zambia and, at a smaller scale, it can be also noted in Ghana and Tanzania, from 1995 to 2010. This persistent movement over periods is escorted by resource allocations to the market services sectors contributing to an active growth of employment on it. Negative sector growth effect [δ'_{jt}], in the agriculture sector, can suggest a problematic behaviour in this sector qualitative upgrades as a highly labour-intensive sector sees is output diminishing with the growth of its primary inputs, labour. A closer look at the results of the decomposition show that the patterns of distribution of the resources is very different between these countries. In Zambia there is a clear flow of resources out of the agriculture sector, but the labour the sector employs' is rising, while output decreases, at a much higher pace that in the moderns'

[24] Labour-Intensity as the ratio of the total number of workers in all sectors divided by the aggregate output from all sectors.

sectors of manufacturing or market services, this last one drives is increase on employment level by output increases from the new advantageous relative output allocations. A specialization in agriculture would imply a movement of resources or increases of output generated but such movements can only be observed regarding the other industries group, which includes construction and mining and doesn't absorb labour at the quantities desired as it is a capital-intensive industry. There are also considerable flows of resources from the agriculture activities to market services sectors and some to manufacturing, sectors that see their productivity levels rise, modestly, from 1990 to 2010; see Figure.3e), pp. 38.

These patterns suggest a severe constraint for Zambia channels of absorption to process the distribution of workers to more advanced activities as resources are chiefly directed to the market services capacity building, making the traditional sector a possible last refuge for production. Tanzania and Ghana, that also present a strong resource displacement effect, seeing their growth in the employment level being redirected to the manufacturing and market services sectors. In Tanzania case, the periods variations for workers level in agriculture is high when compared with the remaining sectors but the effect of the sector growth, reinsures its role as a more than ideal counter weight to wide frictional constrains in the movement of workers and losses of resources due to positive resources displacement effects. If we look particularly at the agriculture sector, it is the only sector that sees its sectoral labour productivity growth, constantly, on the positive side while on manufacturing and market services activities it is static[25], allowing these two sectors to possibly continue to increase their employment levels, via output growth, without compromising the labour productivity of the economy. Tanzania output weight of the manufacturing activities, ensures that output growth leads to employment creation in the sector. As Mcmillan and Rodrik (2014) as well as Kaplinsky and Farooki (2010) made note, the birth of new enterprises and the investment in upgrading the products and processes is fundamental and symbiotic as one without the other, in the end, do not conduct to a structural transformation capable of promoting and sustain higher incomes. Ghana employment is channelled in a similar way, but resources are being directed to the market services activities allowing them to absorb considerable

[25] See Figure_3g), Annex A, pp 38., Tanzania' agriculture sector labour productivity suffers an extraordinary decrease in the period from 2005 to 2010, this may be owed to the fairly aleatory time points selected. A meaningful increased on the sectors' labour productivity do occurs from 1990 to 2010.

amounts of the employment, helped by more favourable flexibility to match employment needs in the sector, translated by the labours hare effect. This magnitude of the labour share effect seems specific to the market services sector in all countries, again it's a sector that shows an unstable or negative labour productivity growth nature, generally.

Kenya employment growth, exhibits an interesting behaviour with high labour share effects both in manufacturing and market services even in periods where there is a relative movement of resources out of these two activities. It presents a positive sector growth effect, suggesting a pattern of production more intensive in labour that started to signal dynamism from the middle of the period under observation, onwards.

Nigeria strong growth effect and relative resource allocations in agriculture keep holding and improving the sectors' employment level and no structural change movement emerges from the results, at a minimum a consolidated drift to activities with higher productivity is noted but the drift of resources, negative resource displacement effect, to market services activities has also made a remarkable contribution to the growth effect of this sector, even accelerating its own growth. In fact, all Nigerian sectors experienced relative resource allocations from 1995 to 2010, at the expense of sectors related to extraction activities, but the greatest effect they produced was on the agriculture sector keeping it as a huge, immobilized, labour supply pool that is locked onto the traditional activity. Adenikinju (2015), alludes to the over reliance that Nigerian firms depose on the size of their domestic markets as a true keeper of their development discarding, in a tragical way, important channels for both growth and development that could make them, ironically, start growing.

If strong persisting effects from output growth in channelling and holding workers on the agriculture production, negative resource displacement effects in both manufacturing and market services are a good pronounce for attempts to create the conditions for the emergence and nurturing of more technological advanced, but still labour intense, activities that can accelerate the shift of workers out of the agriculture practices.

Overall, there is a clear pattern that channels' the workforce to the market services drove by a displacement of resources in its direction and its effects on sector output growth but in most of the cases analysed, the labour productivity growth is erratic or

even negative, in the market services activities across the countries selected, as Figure.3 on page 37 resumes, and that a practical incapacity to continue to increase its employment levels at a pace fast enough to lead a true structural transformation by accelerating the economy labour productivity growth may be real. Countries that experience positive resource displacement effects, at the economy level, seem to reap the benefits of producing higher valued outputs, although, the dynamics inside the agriculture sector are unique to each of these cases, as a continued increases of employment level followed by decreases of output growth may have severe effects.
Now, relatively to the analysis of the sectoral contributions to labour productivity, a clear pattern can be draft from the primary origin of the overall gains, but this pattern also suggests possible constraints on the improvement of the economy-wide labour productivity.
Decomposition results for the sectors contributions can be accessed in Table IV, pp. 42, and for the economies in Figure.4; pp 39 (from 4a) to 4g)). They are compatible, to some extent, with Diao *et al*. (2017) results and Timmer et al. (2015) regarding the Intra and Structural effects contributions to labour productivity, but the contributions from each sector turns to be considerable different. The rearrangements of the output share, considering the sectoral relative output prices, represents the growth of output from sector *i* regarding the output growth of the economy, allowing additional interactions[26] to independently alter the contribution to labour productivity from each sector and, ultimately, look at the sectoral contributions in a different way.
Market services activities are the top contributor to overall increases in labour productivity due to structural and resource shifts effects in most of the countries, as was expected from literature review. More interesting are the patterns of contribution in the agriculture and manufacturing sectors were the loss of weight in the economy turns their overall contribution into a negative component, as we can see regarding Senegal and Zambia[27], two clear examples were accentuated shifts of resources lead to negative contributions from the manufacturing sector suggesting to fast acceleration towards market services sectors can jeopardize other advanced sectors contributions with a shock on the resources allocations. Tregenna (2013), notes that salvaging lost capacity

[26] Sectoral output price improvements, capital allocations, productive advantages, etc…
[27] See Table IV, pp. 42.

in manufacturing can be a hard endeavour as competitive capability migrate to regions with low labour-costs and high labour supply, an evidence identified by Haraguchi *et al*. (2016).

Contrasting, Tanzania, the only country to have positive contributions from manufacturing, throughout the twenty years, sees a constant positive resource shift to the manufacturing sector that combines with an also positive structural component. A constant outflow of resources from manufacturing, in many of the countries analysed, is the norm and contributions patterns seem to be extremely erratic and subject to resource flows orientations. In Senegal and Kenya, manufacturing is contributing almost exclusive through the structural effect and with a redefinition of the resource allocations it could start to contribute positively to the overall productivity. On the other hand, in Kenya, also in Zambia, the agriculture sector of the country show signs of a problematic performance, as resources are reallocated to other sectors, the sector seems to not be capable of generate the need intra effects to contribute positively to labour productivity since a positive structural component is not to be expected or to prevail without some degree of specialization.

Ghana, Malawi and Tanzania agriculture activities show signs being capable to contribute positively through intra sectoral developments of productivity even when resource shifts effects are in the opposite direction, suggesting gains of competitiveness through the sector in the respective periods.

Nigerian pattern of resource shifts seems to be dictating the contributions of each sector throughout the four periods suggesting an erratic pattern of allocation that only contributed positively on the last two subperiods of the analysis. The positive contribution from agriculture in the four periods wasn't expected, however, as both internal factors and structural ones combine, in very distinct periods, with constantly positive shift of resources to the sector, strong contributions to the overall labour productivity are achieved.

The relative shifts of resources seem to be constraining greater contributions to the total from each of the sectors potential due to an over reliance on the returns from activities in the market services sectors.

The other industries sector presents important weights in the contribution to the total labour productivity but due to its specific activities, mining and construction,

contributions are dependent from international factors and national economic and planning dynamics. Nigeria, a fuel exporter country (UN, 2014), sees is contribution from the other industries sector to promote great contributions in periods of favourable commodities prices and Ghana has is contribution drastically increasing from 2005 to 2010, in part, due to a strong dynamism on the construction sector.

4. Conclusions

The analysis of the employment level and contributions to productivity at a sectoral level for seven Sub-Saharan Africa countries over the period 1990-2010, reveals the heterogeneity of experiences and patterns where relative weights of each sector production influences the channels designed to allocate labour and the overall contribution to labour productivity improvements.

These simple methods applied to measure the direct contribution to sectoral productivity and employment levels explained by proximate sources of changes for these two dimensions make in no moment reference to causality.

Output growth effects, as expected, are the chief contributing channel for the allocation and variation of the employment levels; however, positive contributions from the labour share effects don't prevail, suggesting limited (re)allocations of the workforce by the productive activities.

Strong effects from the rearrangements of the output shares, namely in Zambia, seem to hide an accentuated loss of value in agriculture that can produce vicious effects when combined with a time persistent increase of the total level of workers in the sector, as income per head continues to decrease.

Regarding contributions to the labour productivity, the results show that the market services sector is the major contributor to gains on the labour productivity of the economies studied but such contribution as a mixed effect as it depends on the over weighting of the sector output importance relatively to the other productive activities, diverting from them important construction blocks of their structure. An over reliance, due to possible higher returns, accompanied by a sectoral productivity growth that is diminishing while no other sector individual productivity presents any extraordinary

impetus, on the overall, independently of having productivities above or below the average of the economy.

Manufacturing activities are sensible to output shares reweights, but cases of complete deindustrialization, labour share and output decline in simultaneous, are rare consisting of only four occurrences on four distinct countries and three of them during the same subperiod.

Contrary to Mcmillan *et al*. (2014) and Diao *et al*. (2017) my conclusions point to a less significative role from agriculture in prompting the economy labour productivity standards as the intra effects are confronted by resource shifts effects that directly transfer an important portion of the sector contribution to other sectors. However, agriculture labour-absorption channels do show that under constant output growth, the diminishing output weight, on the total output, can be mitigated and so labour levels can increase while productivity rises on the sector, contributing positively to the economies productivity.

In the same line, with variant method, of de Vries *et al*. (2013) or Timmer *et al*. (2015), this analysis also captures an intensive movement of workers to the market services activities, but we access that such movement follows the output importance and resource allocation aimed at it.

Rodrik (2009), Mcmillan *et al*. (2014) and Diao et al. (2017), our results do also show a great potential to growth driven by structural change, but the evolution of relative output weights from each sector suggest that this potential will continue to be kept still if active government support, promotion and diversification of low-skilled labour production activities doesn't materialize. An active policy of currency depreciation or funding trough subsidies and other policy tools could, in the short run, create stimulus to increase capacity and income of tradable goods activities (Mamillan *et al*., 2011; Rodrik, 2015); however, the major constraint that lays on the severely low consumption capacity of the population could keep any deviation of the good willed policy effort by land.

A real and generalized income growth in Sub-Saharan Africa seems to continue to be a tuff problem to solve and an only hope to confront poverty and inequality alike.

Limitations and Future Research

The direct measurements obtained in this research, reveal distinct patterns of growth of the output per worker and of the importance of the channels through which labour is absorbed by the different economic activities.

The broad measurement of the labour input applied should be refined as it imposes a severe limitation to a deeper analysis of the income distribution per sector. The unavailability of a long time-series on sectoral capital stocks also poses a profound limitation in the research as it ultimately would allow for a greater partition and/or extension of the component effects studied.

When accessing patterns of change, based on country comparisons, we are looking at the relative associations between components and significant differences can underline similar patterns. Thus, an exhaustive study over input-output dynamics of profounder partitions of the analysed sectors would add additional contrast to the overall mechanics that were delineated, as transfers of workers and productivity contributions could be filtered by the importance of the activity in the network that builds and promotes the production capacities of the economy.

This worked tries to dive, from a different angle, onto an important subject of development studies field, structural change, where the allocation of the workforce across different productive structures of the economy can bolster income and promote higher standard of livings, by applying accounting techniques over two specific dimensions of interest, labour-absorption channels and labour productivity changes from sectoral contributions.

The models are adapted from different authors and even in the absence of a previously saw use of them, we take no credit in their development.

Nonetheless, the decomposition results and methods should be extended to other geographical regions, to more sectors of production and in time frame to trace converging and diverging patterns of structural transformation.

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Appendix

The set of the four addictive components extracted from the decomposition of the defined productive sectors, in the total of the employment level is detailed as follows. Denoting $\theta_{jt} = L_{jt}$ as the employment in country j at time t and L_{ijt} as the employment level in a given sector i, so that $L_{jt} = \sum_{i=1}^{n} L_{ijt}$, with ($i$ = 1, …, n) and (j = 1, …, m). The economy j employment level is $\theta_{jt} = \sum_{i=1}^{n} L_{ijt}$. The analyse of the changes in the employment level, of a given sector i, through decomposed components associated with changes on factors that characterize the sector, established by the identity presented on section.3.

Changes on the sectoral employment levels are defined as a product of its inverse output share λ_{ijt}, its labour share γ_{ijt}, its output δ_{ijt} and the overall economy labour-intensity ρ_{jt}.

$$\theta_{jt} \equiv \sum_{i} L_{ijt} \equiv \sum_{i} \lambda_{ijt}\gamma_{ijt}\delta_{ijt}\rho_{jt}$$

To decompose the change in the sectors employment level over a period h leads to the rewriting of the described identity

$$\Delta\theta_{ij} = \sum_{i} L_{ijt+h} - L_{ijt} = \sum_{i} \lambda_{ijt+h}\gamma_{ijt+h}\delta_{ijt+h}\rho_{jt+h} - \lambda_{ijt}\gamma_{ijt}\delta_{ijt}\rho_{jt}$$

From this new identity it's possible to present four alternative formulations

$$\text{F1} \equiv (\lambda_{ijt+h} - \lambda_{ijt})\left(\frac{\gamma_{ijt+h}\delta_{ijt+h}\rho_{jt+h} + \gamma_{ijt}\delta_{ijt}\rho_{jt}}{2}\right) + \left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{6}\right)\Bigg((\gamma_{ijt+h} - \gamma_{ijt})\left(\frac{\delta_{ijt+h}\rho_{jt+h} + \delta_{ijt}\rho_{jt}}{2}\right) +$$

$$(\delta_{ijt+h} - \delta_{ijt})\left(\frac{\gamma_{ijt+h}\rho_{jt+h} + \gamma_{ijt}\rho_{jt}}{2}\right) + (\rho_{jt+h} - \rho_{jt})\left(\frac{\gamma_{ijt+h}\delta_{ijt+h} + \gamma_{ijt}\delta_{ijt}}{2}\right) +$$

$$2\Bigg((\gamma_{ijt+h} - \gamma_{ijt})\left(\frac{\delta_{ijt+h} + \delta_{ijt}}{2}\right)\left(\frac{\rho_{jt+h} + \rho_{jt}}{2}\right) + (\delta_{ijt+h} - \delta_{ijt})\left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{2}\right)\left(\frac{\rho_{jt+h} + \rho_{jt}}{2}\right) +$$

$$(\rho_{jt+h} - \rho_{jt})\left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{2}\right)\left(\frac{\delta_{ijt+h} + \delta_{ijt}}{2}\right)\Bigg)\Bigg)$$

$$F2 \equiv (\gamma_{ijt+h} - \gamma_{ijt}) \left(\frac{\lambda_{ijt+h}\delta_{ijt+h}\rho_{jt+h} + \lambda_{ijt}\delta_{ijt}\rho_{jt}}{2}\right) + \left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{6}\right)\Bigg((\lambda_{ijt+h} - \lambda_{ijt}) \left(\frac{\delta_{ijt+h}\rho_{jt+h} + \delta_{ijt}\rho_{jt}}{2}\right) +$$

$$(\delta_{ijt+h} - \delta_{ijt}) \left(\frac{\lambda_{ijt+h}\rho_{jt+h} + \lambda_{ijt}\rho_{jt}}{2}\right) \Bigg) + (\rho_{jt+h} - \rho_{jt}) \left(\frac{\lambda_{ijt+h}\delta_{ijt+h} + \lambda_{ijt}\delta_{ijt}}{2}\right) +$$

$$2\Bigg((\lambda_{ijt+h} - \lambda_{ijt}) \left(\frac{\delta_{ijt+h} + \delta_{ijt}}{2}\right) \left(\frac{\rho_{jt+h} + \rho_{jt}}{2}\right) + (\delta_{ijt+h} - \delta_{ijt}) \left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{2}\right) \left(\frac{\rho_{jt+h} + \rho_{jt}}{2}\right) +$$

$$(\rho_{jt+h} - \rho_{jt}) \left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{2}\right) \left(\frac{\delta_{ijt+h} + \delta_{ijt}}{2}\right)\Bigg)\Bigg)$$

$$F3 \equiv (\delta_{ijt+h} - \delta_{ijt}) \left(\frac{\lambda_{ijt+h}\gamma_{ijt+h}\rho_{jt+h} + \lambda_{ijt}\gamma_{ijt}\rho_{jt}}{2}\right) + \left(\frac{\delta_{ijt+h} + \delta_{ijt}}{6}\right)\Bigg((\lambda_{ijt+h} - \lambda_{ijt}) \left(\frac{\gamma_{ijt+h}\rho_{jt+h} + \gamma_{ijt}\rho_{jt}}{2}\right) +$$

$$(\gamma_{ijt+h} - \gamma_{ijt}) \left(\frac{\lambda_{ijt+h}\rho_{jt+h} + \lambda_{ijt}\rho_{jt}}{2}\right) + (\rho_{jt+h} - \rho_{jt}) \left(\frac{\lambda_{ijt+h}\gamma_{ijt+h} + \lambda_{ijt}\gamma_{ijt}}{2}\right) +$$

$$2\Bigg((\lambda_{ijt+h} - \lambda_{ijt}) \left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{2}\right) \left(\frac{\rho_{jt+h} + \rho_{jt}}{2}\right) + (\gamma_{ijt+h} - \gamma_{ijt}) \left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{2}\right) \left(\frac{\rho_{jt+h} + \rho_{jt}}{2}\right) +$$

$$(\rho_{jt+h} - \rho_{jt}) \left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{2}\right) \left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{2}\right)\Bigg)\Bigg)$$

$$F4 \equiv (\rho_{jt+h} - \rho_{jt}) \left(\frac{\lambda_{ijt+h}\gamma_{ijt+h}\delta_{ijt+h} + \lambda_{ijt}\gamma_{ijt}\delta_{ijt}}{2}\right) + \left(\frac{\rho_{jt+h} + \rho_{jt}}{6}\right)\Bigg((\lambda_{ijt+h} - \lambda_{ijt}) \left(\frac{\gamma_{ijt+h}\delta_{jt+h} + \gamma_{ijt}\delta_{jt}}{2}\right) +$$

$$(\gamma_{ijt+h} - \gamma_{ijt}) \left(\frac{\lambda_{ijt+h}\delta_{jt+h} + \lambda_{ijt}\delta_{jt}}{2}\right) + (\delta_{ijt+h} - \delta_{ijt}) \left(\frac{\lambda_{ijt+h}\gamma_{ijt+h} + \lambda_{ijt}\gamma_{ijt}}{2}\right) +$$

$$2\Bigg((\lambda_{ijt+h} - \lambda_{ijt}) \left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{2}\right) \left(\frac{\delta_{jt+h} + \delta_{jt}}{2}\right) + (\gamma_{ijt+h} - \gamma_{ijt}) \left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{2}\right) \left(\frac{\delta_{jt+h} + \delta_{jt}}{2}\right) +$$

$$(\delta_{ijt+h} - \delta_{ijt}) \left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{2}\right) \left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{2}\right)\Bigg)\Bigg)$$

Given that none of these formulations is preferable over the others leads to the use of the arithmetic mean of the term that share the same change element, hence $\Delta\theta_{ij} = \lambda' + \gamma' + \delta' + \rho'$, where

$$\lambda' = (\lambda_{ijt+h} - \lambda_{ijt}) \left\{ \left(\frac{\gamma_{ijt+h}\delta_{ijt+h}\rho_{jt+h} + \gamma_{ijt}\delta_{ijt}\rho_{jt}}{8}\right) + \frac{1}{12}\Bigg(\left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{2}\right) \left(\frac{\delta_{ijt+h}\rho_{jt+h} + \delta_{ijt}\rho_{jt}}{2}\right) +$$

$$\left(\frac{\delta_{ijt+h} + \delta_{ijt}}{2}\right) \left(\frac{\gamma_{ijt+h}\rho_{jt+h} + \gamma_{ijt}\rho_{jt}}{2}\right) + \left(\frac{\rho_{jt+h} + \rho_{jt}}{2}\right) \left(\frac{\gamma_{ijt+h}\delta_{ijt+h} + \gamma_{ijt}\delta_{ijt}}{2}\right) + 6\left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{2}\right) \left(\frac{\delta_{ijt+h} + \delta_{ijt}}{2}\right) \left(\frac{\rho_{jt+h} + \rho_{jt}}{2}\right)\Bigg)\Bigg\}$$

$$\gamma' = (\gamma_{ijt+h} - \gamma_{ijt}) \left\{ \left(\frac{\lambda_{ijt+h}\delta_{ijt+h}\rho_{jt+h} + \lambda_{ijt}\delta_{ijt}\rho_{jt}}{8}\right) + \frac{1}{12}\Bigg(\left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{2}\right) \left(\frac{\delta_{ijt+h}\rho_{jt+h} + \delta_{ijt}\rho_{jt}}{2}\right) +$$

$$\left(\frac{\delta_{ijt+h} + \delta_{ijt}}{2}\right) \left(\frac{\lambda_{ijt+h}\rho_{jt+h} + \lambda_{ijt}\rho_{jt}}{2}\right) + \left(\frac{\rho_{jt+h} + \rho_{jt}}{2}\right) \left(\frac{\lambda_{ijt+h}\delta_{ijt+h} + \lambda_{ijt}\delta_{ijt}}{2}\right) + 6\left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{2}\right) \left(\frac{\delta_{ijt+h} + \delta_{ijt}}{2}\right) \left(\frac{\rho_{jt+h} + \rho_{jt}}{2}\right)\Bigg)\Bigg\}$$

$$\delta' = (\delta_{ijt+h} - \delta_{ijt}) \left\{ \left(\frac{\lambda_{ijt+h}\gamma_{ijt+h}\rho_{jt+h} + \lambda_{ijt}\gamma_{ijt}\rho_{jt}}{8} \right) + \frac{1}{12} \left(\left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{2} \right) \left(\frac{\gamma_{ijt+h}\rho_{jt+h} + \gamma_{ijt}\rho_{jt}}{2} \right) + \right. \right.$$

$$\left. \left. \left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{2} \right) \left(\frac{\lambda_{ijt+h}\rho_{jt+h} + \lambda_{ijt}\rho_{jt}}{2} \right) + \left(\frac{\rho_{jt+h} + \rho_{jt}}{2} \right) \left(\frac{\lambda_{ijt+h}\gamma_{ijt+h} + \lambda_{ijt}\gamma_{ijt}}{2} \right) + 6 \left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{2} \right) \left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{2} \right) \left(\frac{\rho_{jt+h} + \rho_{jt}}{2} \right) \right) \right\}$$

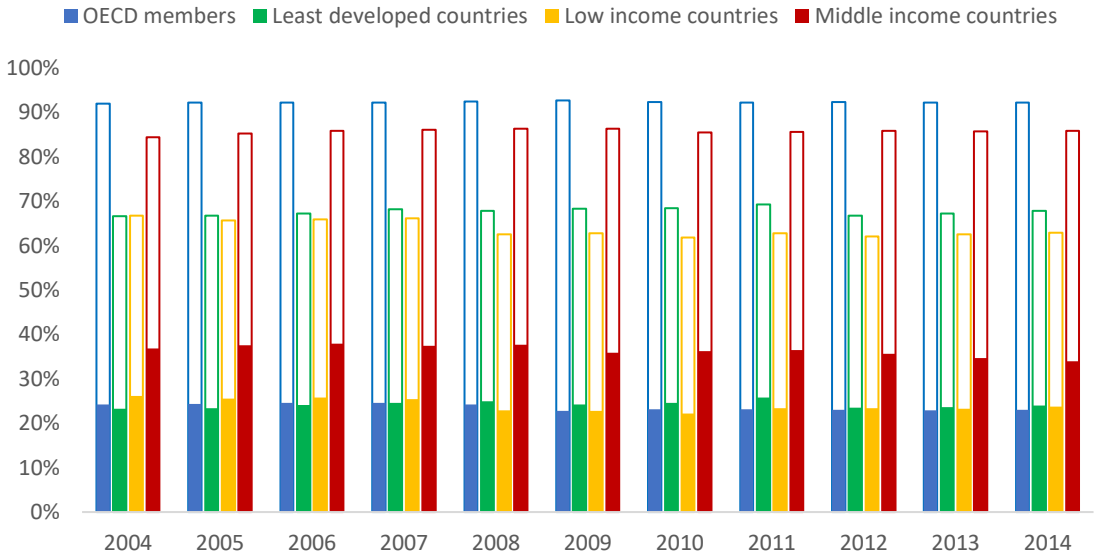
$$\rho' = (\rho_{ijt+h} - \rho_{ijt}) \left\{ \left(\frac{\lambda_{ijt+h}\gamma_{ijt+h}\delta_{jt+h} + \lambda_{ijt}\gamma_{ijt}\delta_{jt}}{8} \right) + \frac{1}{12} \left(\left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{2} \right) \left(\frac{\gamma_{ijt+h}\delta_{jt+h} + \gamma_{ijt}\delta_{ijt}}{2} \right) + \right. \right.$$

$$\left. \left. \left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{2} \right) \left(\frac{\lambda_{ijt+h}\delta_{ijt+h} + \lambda_{ijt}\delta_{ijt}}{2} \right) + \left(\frac{\delta_{ijt+h} + \delta_{ijt}}{2} \right) \left(\frac{\lambda_{ijt+h}\gamma_{ijt+h} + \lambda_{ijt}\gamma_{ijt}}{2} \right) + 6 \left(\frac{\lambda_{ijt+h} + \lambda_{ijt}}{2} \right) \left(\frac{\gamma_{ijt+h} + \gamma_{ijt}}{2} \right) \left(\frac{\delta_{ijt+h} + \delta_{ijt}}{2} \right) \right) \right\}$$

The sum of these components is the exact change of the employment level in sector *i* and the aggregation of all the sectors is the country *j* employment level variation during period *h*.

Annex A – Figures.

Figure.1 - Services and Industry Value Added as % of GDP (2004-2014)



Source: my own.
Data: World Bank – World Development Indicators, (2018).
Note: Columns regard the combined percentage of value added from industry and services sector. The hollow portion respects the percentage hold by the services sector as the filled portion does for the industry sector. Country groups are defined accordingly to the UN classification.

Figure.2 – Decomposition Results: Channels of Absorption for the Employment.

Figure.2a)

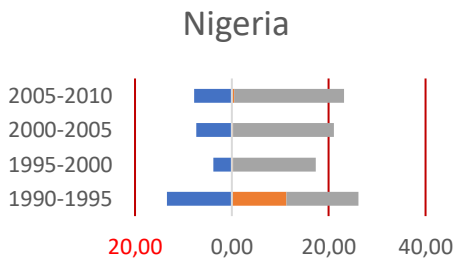


Figure.2b)

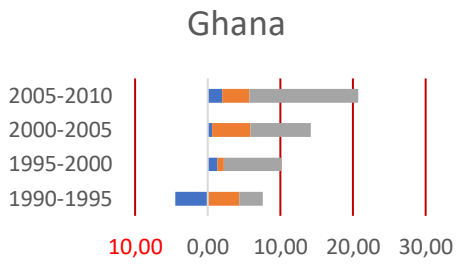


Figure.2c)

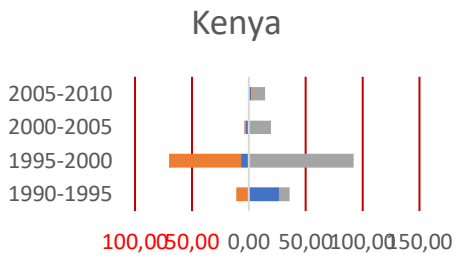


Figure.2d)

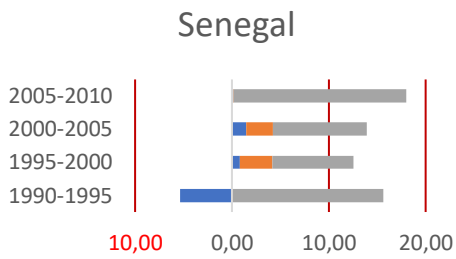


Figure.2e)

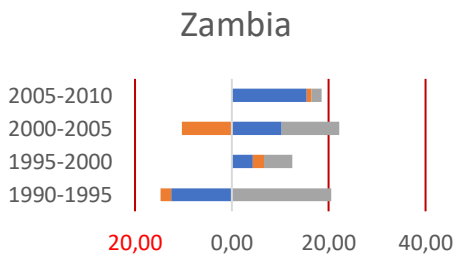


Figure.2f)

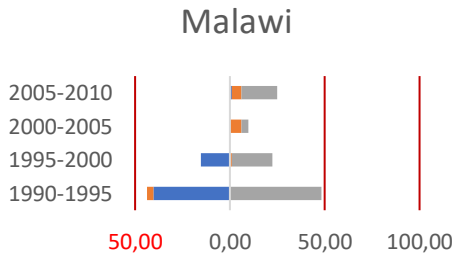
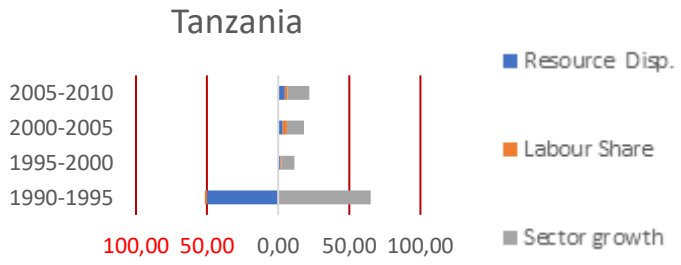


Figure.2g)



Source: my own.
Data: Groningen Growth and Development Centre 10-Sector Database and Inklaar and Timmer (2013).
Notes: Contribution, in percent points, from each channel of absorption to the total percent variation of the period. Contributions from the labour-intensity effect [ρ'_{ijt}], were discounted from the remaining components.

Figure.3 – Sectoral and Economy Wide Period Average Labour Productivity Percent Points Change.

Figure.3a)

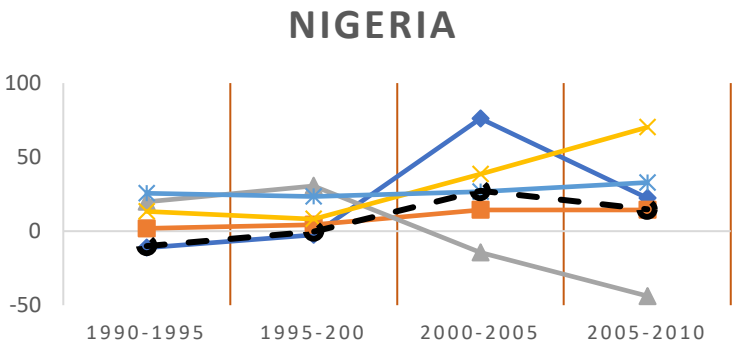


Figure.3b)

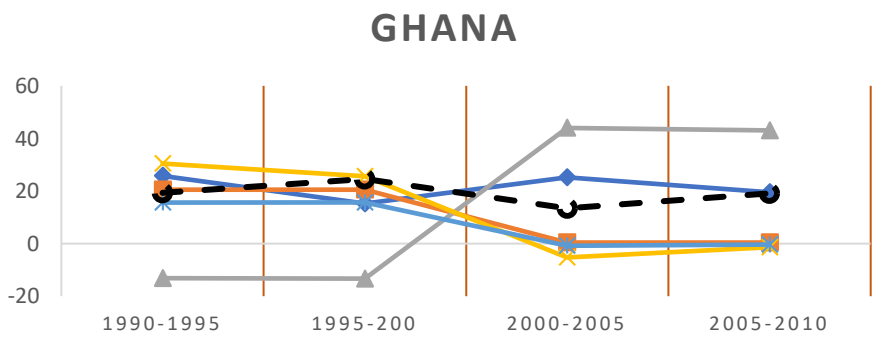


Figure.3c)

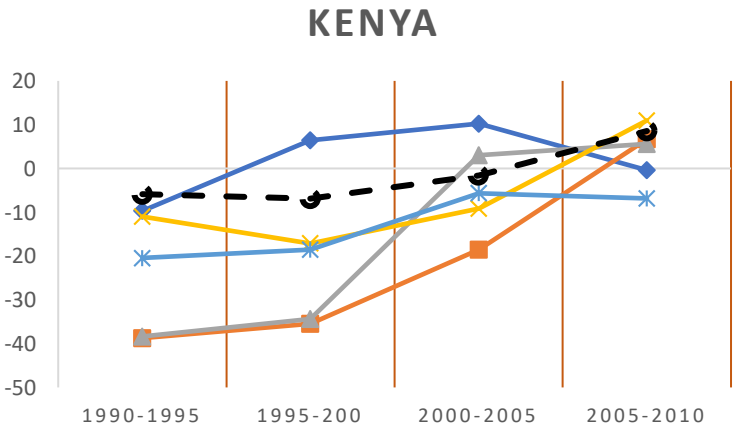


Figure.3d)

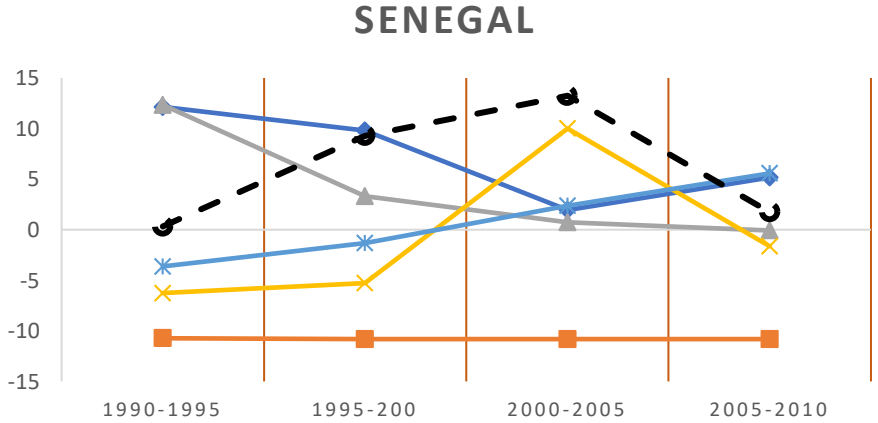


Figure.3e)

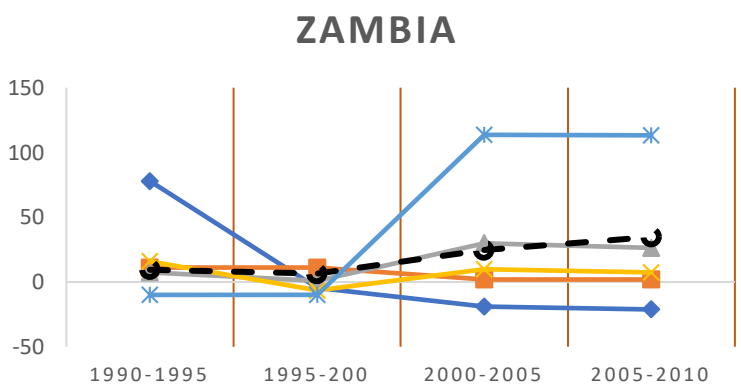


Figure.3f)

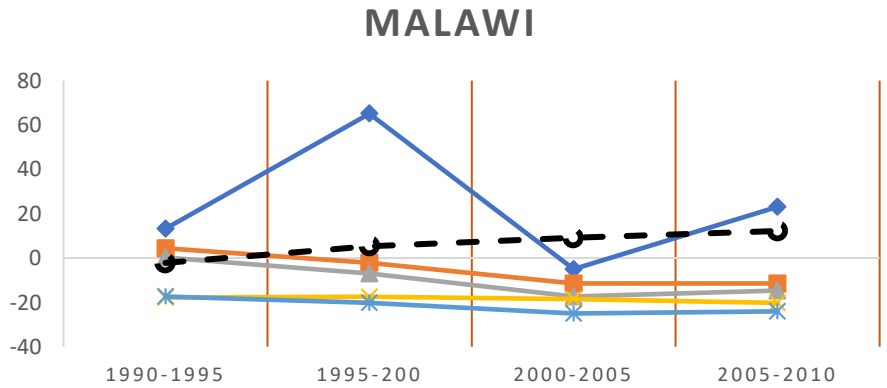
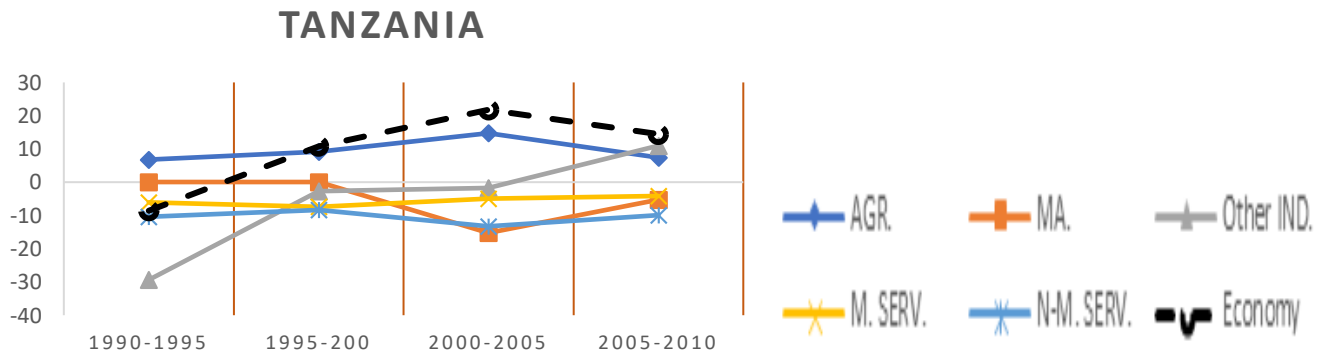


Figure3.g)



Source: my own.
Data: Groningen Growth and Development Centre 10-Sector Database; Inklaar and Timmer (2013).
Notes: Periods percent variation of the economy and sectors average labour productivity, in 2005 PPP dollar. Sectors in order of displayed: Agriculture, Manufacturing, Other Industries, Market Services, Non-Market Services and the Economy.

Figure.4 - Decomposition Results: Effects Contributions to Labour Productivity

Figure.4a)

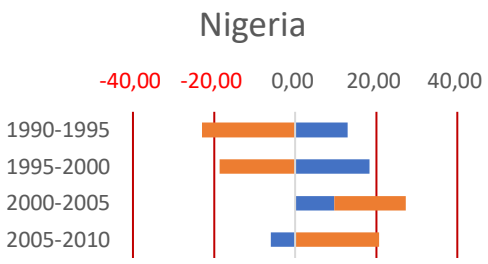


Figure.4b)

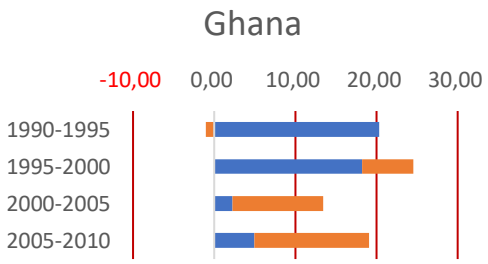


Figure.4c)

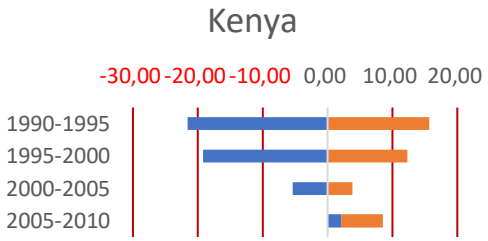


Figure.4d)

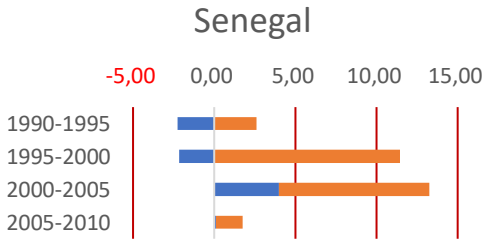


Figure.4e)

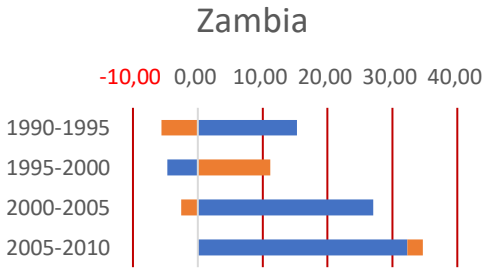


Figure.4f)

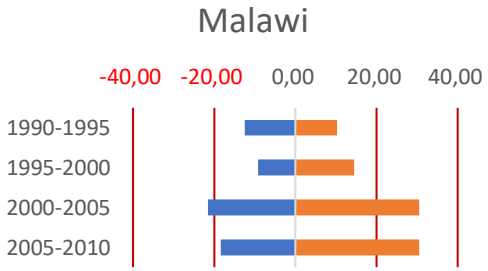
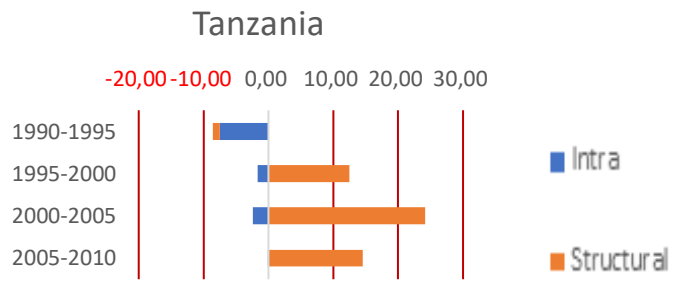


Figure.4g)



Source: my own,
Data: Groningen Growth and Development Centre 10-Sector Database, Inklaar and Timmer (2013).
Notes: Contribution, in percent points, from the Intra and Structural components to the periods variation, in percentage, of the economy average labour productivity. Resource shift components is 0 at aggregate level.

Annex B – Tables.

Table II - Sectoral Constituents

ISIC Rev.3.1 Code	10-Sector Description	ISIC Rev.3.1 Classification
AGRICULTURE		
AtB	Agriculture	Agriculture, Hunting and Forestry, Fishing
MANUFACTURING		
D	Manufacturing	Manufacturing
Other INDUSTRIES		
C	Mining	Mining and Quarrying
E	Utilities	Electricity, Gas and Water supply
F	Construction	Construction
Market SERVICES		
G + H	Trade services	Wholesale and Retail trade; repair of motor vehicles, motorcycles and personal and household goods, Hotels and Restaurants
I	Transport services	Transport, Storage and Communications
J + K	Business services	Financial Intermediation, Renting and Business Activities (excluding owner occupied rents)
Non-Market SERVICES		
L, M, N	Government services	Public Administration and Defence, Education, Health and Social work
O, P	Personal services	Other Community, Social and Personal service activities, Activities of Private Households
TOT	Total Economy	Total Economy

Source: Adapted form de Vries, G. *et al*. (2015) and United Nations (2002) to reflect the 5 sectors studied.

Table III - Decomposition Results: Sectoral Effects Contributions to Employment Levels

		AGRICULTURE				MANUFACTURING				Other INDUSTRIES				MARKET SERVICES				Non-MARKET SERVICES			
	Effect / Period	Resource Disp.	Sector growth	Labour Share	Level Variation	Resource Disp.	Sector growth	Labour Share	Level Variation	Resource Disp.	Sector growth	Labour Share	Level Variation	Resource Disp.	Sector growth	Labour Share	Level Variation	Resource Disp.	Sector growth	Labour Share	Level Variation
Nigeria	1990-1995	-12,55	13,79	13,70	14,94	0,14	-0,11	-0,36	-0,34	0,08	-0,06	-0,42	-0,40	-0,41	0,47	-0,61	-0,55	-0,70	0,77	-0,99	-0,92
	1995-2000	-5,13	13,23	6,55	14,64	0,38	0,03	-0,53	-0,12	-0,02	0,17	-0,32	-0,16	3,43	-0,31	-5,44	-2,32	-2,51	3,92	0,04	1,46
	2000-2005	-6,46	14,20	-0,43	7,31	-0,10	0,83	0,32	1,04	0,10	0,20	0,22	0,52	-0,78	3,87	0,06	3,15	-0,09	1,72	0,11	1,74
	2005-2010	-1,06	9,54	-0,86	7,62	-0,39	1,18	0,39	1,18	0,46	-0,04	0,59	1,00	-6,22	10,05	0,58	4,41	-0,56	1,97	-0,18	1,22
Ghana	1990-1995	-1,44	4,67	0,60	3,84	-2,79	-1,58	3,00	-1,36	0,13	0,30	0,54	0,98	-0,03	0,14	-0,01	0,09	-0,33	-0,32	0,23	-0,42
	1995-2000	1,41	2,48	-0,45	3,44	0,16	0,42	-0,10	0,48	0,24	0,68	0,82	1,75	-0,70	3,63	0,63	3,56	0,23	0,68	-0,02	0,90
	2000-2005	0,09	2,20	-0,96	1,33	0,28	1,67	0,64	2,58	0,22	-2,02	1,44	-0,36	-0,25	4,96	3,54	8,25	0,26	1,48	0,65	2,39
	2005-2010	1,37	2,09	-1,40	2,06	1,20	0,63	-0,34	1,49	-0,88	1,96	0,31	1,39	0,76	6,64	3,11	10,52	-0,45	3,70	2,05	5,30
Kenya	1990-1995	28,61	0,51	-21,24	7,87	0,32	1,03	3,19	4,53	0,49	-0,06	0,64	1,07	-4,04	6,58	4,87	7,41	1,06	1,48	1,57	4,11
	1995-2000	-7,71	85,79	-72,79	5,29	1,49	0,06	2,85	4,39	0,19	0,26	1,02	1,48	-1,42	4,26	3,97	6,81	0,44	1,92	1,98	4,34
	2000-2005	-2,69	12,49	-5,90	3,89	-0,44	2,08	2,85	4,49	-0,24	0,72	0,07	0,55	0,05	2,68	1,64	4,36	0,45	1,61	0,23	2,29
	2005-2010	3,64	1,38	-1,65	3,37	0,02	1,87	0,13	2,02	-0,32	0,92	0,40	1,00	-2,07	5,51	1,71	5,15	1,01	1,22	0,57	2,81
Senegal	1990-1995	-5,42	11,99	-1,86	4,72	-0,41	1,07	1,18	1,84	-0,24	0,48	-0,03	0,21	-0,27	2,00	1,44	3,17	0,99	-0,05	-0,62	0,32
	1995-2000	1,25	1,66	-1,32	1,59	0,39	0,83	0,81	2,03	-0,56	1,04	0,68	1,17	-0,56	3,78	2,79	6,00	0,33	1,08	0,37	1,78
	2000-2005	2,56	0,67	-1,23	2,01	0,51	1,14	1,04	2,69	-0,30	1,00	0,62	1,32	-1,79	5,91	2,25	6,37	0,50	0,96	0,08	1,54
	2005-2010	-0,28	9,49	-1,38	7,83	0,74	1,03	0,54	2,31	-0,09	0,81	0,16	0,89	-0,42	4,90	1,25	5,73	0,13	1,58	-0,47	1,23
Zambia	1990-1995	-16,54	21,38	0,32	5,16	1,76	-0,96	-1,80	-1,01	2,13	-1,07	-1,96	-0,91	-0,04	0,28	-0,05	0,19	0,20	0,92	1,29	2,41
	1995-2000	6,30	0,47	-2,24	4,53	-0,04	0,36	-0,04	0,28	-0,09	-0,00	0,06	-0,03	-2,05	3,39	3,01	4,34	0,23	1,64	1,49	3,36
	2000-2005	12,11	-2,15	0,87	10,83	0,09	0,47	0,25	0,81	-0,67	1,40	0,57	1,30	-0,23	2,29	1,02	3,09	-1,04	9,95	-13,07	-4,16
	2005-2010	14,86	-2,38	-0,53	11,95	0,35	0,33	0,06	0,74	-0,03	0,96	0,16	1,09	0,37	3,06	1,30	4,73	-0,04	0,11	-0,02	0,05
Malawi	1990-1995	-40,55	48,13	-4,88	2,69	-0,01	0,03	-0,05	-0,03	0,29	-0,25	-0,32	-0,28	-0,41	0,55	1,41	1,55	0,24	-0,11	0,69	0,82
	1995-2000	-15,86	20,38	-1,09	3,43	0,09	-0,00	-0,04	0,05	-0,34	0,54	0,54	0,74	0,03	0,68	1,40	2,11	0,80	-0,32	0,29	0,77
	2000-2005	0,15	-0,03	-0,06	0,06	0,21	0,15	0,22	0,58	-0,16	0,55	0,78	1,17	-0,41	1,76	2,65	4,01	-0,18	1,22	2,39	3,43
	2005-2010	1,70	9,02	-4,63	6,09	-0,58	1,75	1,40	2,57	-0,89	2,16	1,92	3,19	-0,99	5,21	5,24	9,45	1,75	0,80	1,20	3,75
Tanzania	1990-1995	-51,86	63,34	-0,06	11,43	-0,43	0,56	0,10	0,23	-0,34	0,31	0,08	0,05	-0,98	1,55	0,53	1,10	3,33	-0,92	-1,92	0,49
	1995-2000	1,71	6,27	-1,16	6,83	-0,08	0,33	0,20	0,45	-0,18	0,41	0,32	0,56	0,19	0,94	0,78	1,91	0,07	0,76	0,68	1,50
	2000-2005	3,71	6,17	-2,09	7,80	-0,04	0,64	0,64	1,24	-0,28	0,83	0,61	1,16	0,16	2,10	1,39	3,65	-0,31	2,30	2,17	4,16
	2005-2010	5,39	7,44	-2,97	9,86	-0,20	1,01	0,67	1,47	-0,19	0,82	0,25	0,88	-0,67	3,74	2,32	5,39	0,25	2,27	1,58	4,10

Source: my own.

Data: Groningen Growth and Development Centre 10-Sector Database, Inklaar and Timmer (2013).

Notes: Contribution, in percent points, to period variation of sectoral employment levels, in percentage. Values weighted by the contribution of the labour-intensity effect [ρ'_{ijt}].

Table IV – Decomposition Results: Sectoral Effects Contributions to Labour Productivity.

		AGRICULTURE				MANUFACTURING				Other INDUSTRIES				MARKET SERVICES				Non-MARKET SERVICES			
	Effect / Period	Intra	Structural	Resource Shifts	Sector Contribution	Intra	Structural	Resource Shifts	Sector Contribution	Intra	Structural	Resource Shifts	Sector Contribution	Intra	Structural	Resource Shifts	Sector Contribution	Intra	Structural	Resource Shifts	Sector Contribution
Nigeria	1990-1995	-1,20	1,43	1,30	1,53	0,06	-0,62	-0,23	-0,80	10,27	-19,93	-3,73	-13,39	2,55	-2,80	1,90	1,64	1,24	-1,07	0,76	0,93
	1995-2000	-0,29	1,17	0,92	1,80	0,12	-0,48	-0,34	-0,69	15,41	-14,77	0,79	1,44	1,64	-4,55	-2,85	-5,76	1,44	0,03	1,48	2,95
	2000-2005	9,22	-0,34	4,95	13,83	0,44	0,53	0,17	1,14	-9,65	17,06	-7,45	-0,04	7,60	0,15	2,16	9,91	2,05	0,21	0,17	2,44
	2005-2010	3,63	-0,52	0,63	3,74	0,46	0,47	0,46	1,39	-27,97	19,84	-14,64	-22,77	15,37	1,20	12,56	29,14	2,51	-0,32	0,98	3,17
Ghana	1990-1995	2,23	0,38	0,89	3,50	1,24	-0,95	-0,88	-0,59	-1,63	2,92	-0,73	0,57	14,62	-1,45	3,49	16,66	3,84	-1,94	-2,77	-0,88
	1995-2000	1,39	-0,36	-1,13	-0,09	1,14	-0,33	-0,54	0,27	-1,57	3,06	-0,91	0,58	13,72	4,09	4,56	22,37	3,57	-0,13	-1,99	1,45
	2000-2005	1,98	-0,96	-0,09	0,94	0,02	0,47	-0,20	0,29	3,72	-2,13	0,32	1,91	-3,26	11,65	0,83	9,22	-0,18	2,11	-0,86	1,07
	2005-2010	1,49	-1,23	-1,20	-0,94	0,02	-0,33	-1,16	-1,47	4,38	1,27	3,50	9,15	-0,89	9,23	-2,27	6,08	-0,08	5,20	1,13	6,25
Kenya	1990-1995	-1,38	-1,60	-2,16	-5,13	-3,90	3,13	-0,30	-1,06	-3,82	1,92	-1,43	-3,32	-3,22	8,16	6,61	11,54	-9,26	4,08	-2,73	-7,91
	1995-2000	0,78	-1,51	0,16	-0,57	-3,15	1,75	-0,89	-2,29	-2,94	2,07	-0,38	-1,24	-5,99	5,77	2,04	1,82	-7,89	4,22	-0,93	-4,60
	2000-2005	1,28	-1,02	0,47	0,73	-1,44	1,57	0,24	0,37	0,21	0,13	0,46	0,80	-3,21	2,61	-0,08	-0,69	-2,24	0,56	-1,08	-2,77
	2005-2010	-0,04	-0,92	-2,04	-3,01	0,48	0,11	-0,02	0,57	0,45	1,16	0,93	2,53	3,92	4,01	4,84	12,77	-2,68	2,09	-3,71	-4,31
Senegal	1990-1995	1,68	-0,42	1,21	2,47	-1,22	1,91	0,65	1,34	0,83	-0,08	0,72	1,47	-2,44	3,17	0,60	1,32	-1,11	-1,99	-3,19	-6,28
	1995-2000	1,43	-1,43	-1,36	-1,36	-1,28	1,54	-0,74	-0,48	0,29	2,51	2,02	4,82	-2,21	7,26	1,46	6,51	-0,38	1,57	-1,38	-0,19
	2000-2005	0,26	-1,30	-2,71	-3,75	-1,22	1,71	-0,83	-0,34	0,08	2,37	1,13	3,58	4,23	6,11	4,82	15,15	0,65	0,37	-2,41	-1,39
	2005-2010	0,58	-0,31	0,06	0,33	-1,06	0,52	-0,71	-1,26	-0,01	0,42	0,23	0,64	-0,73	2,26	0,75	2,27	1,34	-1,25	-0,34	-0,24
Zambia	1990-1995	11,72	0,20	10,02	21,93	1,02	-3,34	-3,20	-5,52	1,61	-6,32	-6,78	-11,48	3,71	-0,73	0,67	3,64	-2,82	4,55	-0,71	1,03
	1995-2000	-1,05	-1,39	-3,92	-6,36	0,85	-0,18	0,16	0,83	0,16	-2,17	-3,10	-5,11	-1,96	11,20	7,42	16,66	-2,67	3,72	-0,56	0,49
	2000-2005	-4,02	0,55	-7,71	-11,18	0,16	1,24	-0,48	0,92	5,21	4,94	5,76	15,91	3,32	5,89	1,33	10,53	22,40	-15,16	1,10	8,35
	2005-2010	-2,91	-0,24	-6,94	-10,10	0,14	0,29	-1,87	-1,43	5,62	1,90	0,37	7,89	2,68	6,52	-1,88	7,31	26,76	-6,06	10,32	31,02
Malawi	1990-1995	1,21	-0,15	1,27	2,33	0,25	-0,33	0,05	-0,03	0,03	-2,34	-2,06	-4,38	-6,72	8,36	2,39	4,03	-7,22	4,74	-1,65	-4,13
	1995-2000	6,79	-0,40	5,66	12,05	-0,13	-0,29	-0,72	-1,14	-0,88	3,83	2,33	5,28	-7,07	8,79	-0,21	1,51	-7,83	2,60	-7,07	-12,30
	2000-2005	-0,77	-1,32	-3,40	-5,49	-0,63	0,55	-0,52	-0,60	-2,67	4,83	0,97	3,14	-7,90	13,15	1,96	7,22	-9,52	13,29	0,98	4,76
	2005-2010	2,76	-1,94	-0,71	0,10	-0,67	2,17	0,87	2,37	-2,66	8,08	3,55	8,96	-9,54	17,47	3,19	11,12	-8,21	4,74	-6,90	-10,37
Tanzania	1990-1995	1,84	-0,00	4,37	6,21	0,00	0,15	0,64	0,80	-5,38	-1,34	-5,32	-12,04	-1,46	0,77	1,42	0,73	-2,52	-0,64	-1,11	-4,27
	1995-2000	2,87	-0,99	-1,46	0,42	0,00	1,14	0,46	1,60	-0,41	4,31	2,32	6,22	-2,02	3,81	-0,90	0,89	-2,13	4,21	-0,42	1,66
	2000-2005	4,30	-2,39	-4,28	-2,37	-1,23	2,86	0,19	1,81	-0,35	7,43	3,33	10,41	-1,34	5,93	-0,68	3,90	-3,78	10,36	1,44	8,02
	2005-2010	1,91	-2,02	-3,68	-3,80	-0,41	2,03	0,61	2,22	2,20	2,67	2,03	6,90	-1,13	6,57	1,87	7,30	-2,70	5,32	-0,82	1,80

Source: my own.
Data: Groningen Growth and Development Centre 10-Sector Database, Inklaar and Timmer (2013).
Notes: Contribution, in percent points, from the five analysed sectors to periods variation of the overall labour productivity, in percentage.