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Structural Transformation in Africa: Static Gains, Dynamic Losses

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ABSTRACT *This paper places recent growth and structural transformation in 11 Sub-Saharan African countries in historical and international perspective. During the early post-independence period, resources were reallocated to manufacturing activities with high productivity growth. Structural change stalled in the mid-1970s. When it resumed in the 1990s, workers mainly relocated to distributive trade services. Productivity levels in these activities were higher than in agriculture, enhancing overall economy performance. But services productivity growth was sluggish and increasingly falling behind the world frontier. These patterns are also observed in Latin America, but not in Asia.*

1. Introduction

Structural change features prominently in the debate on growth in Africa (for example ACET, 2014). Many African nations have developed visions for achieving middle-income status in the upcoming decades. To realise this vision, profound changes in the production structures of African economies are needed. As labour and other resources move from traditional into modern economic activities, overall productivity rises and incomes expand, as emphasised in seminal work by Lewis (1954) and Kuznets (1966) and quantified by Chenery (1960) and his collaborators (Chenery, Robinson, & Syrquin, 1986; Chenery & Syrquin, 1975). However, there is little evidence that structural change has underpinned recent growth in Africa as levels of industrialisation remain low (McMillan & Rodrik, 2011; Page, 2012).¹

How unique is the current pattern of growth and structural transformation in Africa? This paper puts the recent experience in a long-run and international perspective by developing a new database on sectoral value added and employment. Consistent long-run time series for Africa are largely absent, and McMillan and Rodrik (2011) present a first attempt to address this gap based on data from 1990 onwards. We extend their analysis by considering the period since 1960, which allows us to compare the recent period to the golden age of Africa's growth performance, which occurred in most countries in the 1960s and 1970s (Ellis, 2002). We additionally provide comparisons of structural change and productivity growth in Africa with Asia and Latin-America. Our analysis is based on a new dataset with annual time series of value added and persons engaged for the ten main sectors of the economy in 11 Sub-Saharan countries, called the Africa Sector Database. These countries together cover about

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70 per cent of African GDP. The dataset is based on a critical assessment of the coverage and consistency of concepts and definitions used in various primary data sources

We find that Africa's economic structure is changing rapidly with a growing share of services activities, in particular distribution services. In 2010, on average 20 per cent of the workforce in our country sample was engaged in these services, up from 11 per cent in 1990. While the pace of structural change in the recent period is comparable to that of Africa's golden age, its effect on aggregate growth has been rather different. This is shown by a novel variant of the canonical structural decomposition method in which aggregate labour productivity growth is decomposed into growth at the sector level and a reallocation effect. We split the latter into the effect of reallocation of workers to sectors with above average productivity *levels* (static effect) and to sectors with above average productivity *growth* (dynamic effects). Since 1990 resources are shifted towards services sectors that have sluggish performance and are increasingly falling behind world productivity frontiers in 10 of the 11 African economies analysed. A new technology gap has opened up in both manufacturing and services, as productivity has dropped to about 10 per cent of the levels found in the United States in 2010.

The remainder of this paper is structured as follows. [Section 2](#) describes the Africa Sector Database and assesses its overall reliability. Key stylised facts and productivity trends are presented in [section 3](#). [Section 4](#) discusses the method to decompose aggregate productivity growth into the contribution of shifts of labour across sectors, and productivity growth within sectors. The findings for Africa are put in international perspective by making comparisons with Asia and Latin America. [Section 5](#) uses new sector-specific Purchasing Power Parities (PPPs) to examine the distance of African productivity levels to those in other regions in the world. [Section 6](#) provides concluding remarks.

2. The Africa Sector Database

Existing analyses of economic transformation in Africa are hampered by the reliability and availability of data on output and productivity trends by sector. Although the United Nations National Accounts Statistics provide long run data on value added by sector from 1970 onwards, companion employment data are missing. Alternative data sources such as the World Development Indicators (WDI) provide limited and dispersed employment data for Sub-Saharan African countries. For example, according to the WDI (2011), employment in Ethiopian agriculture is 22 million in 1994, then radically drops to 3 million in 2004, rises again to 28 million in 2005, and is suddenly 3 million again in 2006. McMillan and Rodrik (2011) present a first attempt to address these shortcomings by developing a sector database for Africa, but their dataset is confined to the post-1990 period. The Africa Sector Database is a new step forward, providing long-run output and employment data for 11 African countries since 1960 (see de Vries, Timmer, & de Vries 2013a for a comparison to existing international datasets).

The Africa Sector Database consists of data for 11 Sub-Saharan African (SSA) countries for the period 1960–2010 that together account for about 70 per cent of SSA GDP. It covers countries from East Africa (Ethiopia, Kenya, and Tanzania), West Africa (Ghana, Nigeria, and Senegal), and Central and Southern Africa (Botswana, Malawi, Mauritius, South Africa and Zambia). It includes annual data on gross value added at current and constant prices from 1960 to 2010. It also includes data on persons engaged, which allows the derivation of labour productivity (value added per worker) trends. The database covers the 10 main sectors of the economy as defined in the International Standard Industrial Classification, Revision 3 (ISIC rev. 3): Agriculture, hunting, forestry and fishing (AtB); Mining and quarrying (C); Manufacturing (D); Electricity, gas and water supply (E); Construction (F); Wholesale and retail trade, hotels and restaurants (GtH); Transport, storage, and communication (I); Finance, insurance, real estate and business services (JtK); Government services (LtN); and Community, social and personal services (OtP). Together these 10 sectors cover the total economy. Data and detailed documentation of sources and methods are publicly and freely available at www.ggdc.net/asd. In this section we briefly discuss the methods and sources as well as the reliability of the data.

2.1 Construction of the Variables

Gross value added in current and constant prices is taken from the National Accounts of the various countries. These have all been compiled according to the UN System of National Accounts and international comparability is high in principle (Gollin, Lagakos, & Waugh, 2014). National statistical institutes frequently change their methodologies so in the National Accounts GDP series are periodically revised. These revisions typically include changes in the coverage of activities (for example after a full economic census has been carried out and ‘new’ activities have been discovered), changes in the methods of calculation (for example the inclusion of software expenditures as investment or new ways to measure the value added in the telecommunications sector).² In addition, the base year of the prices used for calculating volume growth rates is typically updated.³ For sectoral GDP our general approach is to start with GDP levels for the most recent available benchmark year (as of 2013) from the National Accounts provided by the National Statistical Institute or Central Bank. Historical national accounts series were subsequently linked to this benchmark year.⁴ This linking procedure ensures that growth rates of individual series are retained although absolute levels are adjusted according to the most recent information and methods.

Employment in our data set is defined as ‘all persons engaged’, thus including all paid employees, but also self-employed and family workers of 15 years and older.⁵ Data for males and females separately is available as well. Ideally, hours worked should be collected as well, but these data are irregular and sparse and typically only covers the formal sector. Labour input is often not available from a country’s national accounts as they are not part of the System of National Accounts. Three different primary sources of employment exist, namely population and housing censuses, labour force surveys (LFS) with data collected at the household level, and business surveys that are based on firm-level questionnaires. All three sources have their advantages and disadvantages as a source for annual sectoral employment trends (de Vries et al., 2013a).

We prefer the use of population censuses, which are based on household questionnaires but with a much larger coverage than the samples of the LFS. This ensures full coverage of the working population and a much more reliable sector breakdown than from the LFS. However, typically population censuses are quinquennial or decennial and cannot be used to derive annual trends. Therefore we use the population census to indicate absolute levels of employment, and use LFS and business surveys to indicate trends in between. This is the general strategy followed for most countries, except for Nigeria and Senegal (see de Vries, Gouma, de Vries, & Timmer, 2013b for a detailed discussion).

2.2 Consistency

The time series of gross value added and employment are consistent over time. Through linking procedures, major breaks in the series have been repaired. International consistency is ensured through the system of national accounts for value added, the employment concept of persons engaged and the use of a harmonised sector classification. We classify activities into 10 sectors, using the International Standard Industrial Classification (ISIC), Revision 3.

For the derivation of meaningful productivity measures, the labour input and output measures should cover the same activities. As we use persons engaged as our employment concept rather than employees, and base our employment numbers on large-scale surveys, overlap in coverage of the employment statistics and value added from the National Accounts is maximised. However, a notable exception is the own-account production of housing services by owner-occupiers. For this an imputation of rent is made and added to GDP in many countries, according to the System of National Accounts. This imputed production does not have an employment equivalent and should preferably not be included in output for the purposes of labour productivity comparisons. Typically, imputed rents are included in the output of the financial and business services sector and frequently increase output in this sector by 50 per cent or more without any labour input equivalent. Worse, this percentage varies over time and across countries. Therefore, the Africa sector database presents separate series for imputed rents. In our analysis below, we exclude imputed rents.

2.3 Reliability Issues

The quality of national statistics varies highly across African countries. Recently, various scholars have pointed out anew that the statistical foundations underlying GDP and employment estimates in various African countries are subject to large measurement error, and have referred to these weak fundamentals for growth and productivity analysis as ‘Africa’s statistical tragedy’ (Devarajan, 2013; Jerven, 2013; Jerven & Johnston, 2015). The low quality of statistics is related to a weak capacity to collect, manage, and disseminate the data; inadequate funding of statistical offices; diffuse responsibilities on who is collecting what; and fragmentation in surveys and gathering exercises (Devarajan, 2013). Young (2012) has argued that many African countries do not have a well-established statistical system, not even reporting national accounts data on a consistent basis. He therefore explores alternative sources of information on national income using demographic and health survey data. However, most countries included in the Africa Sector Database do have a considerable history of collecting national accounts data and in conducting labour and household surveys. We therefore take an in-depth country-by-country approach to study available statistics and use linking procedures that aim to ensure internal, inter-temporal, and international consistency as best as possible. In this way, we aim to come up with the best possible estimates by obtaining as much available official statistical information as possible.

Clearly, we are unable to satisfactorily solve all quality issues with the data. In general we note that growth rate comparisons are probably more reliable than comparisons of absolute levels. The error in the change from year to year is likely to be less compared to the absolute values if the national accountant only considers the probable change from the previous year (Blades, 1980). Also, real growth rates are often more reliable than nominal growth rates because many surveys measure changes in production volumes (such as tons of steel or passenger kilometres by train) and not values. Finally, using 5–10 year averages of real growth rates in analyses is less likely to suffer from bias (see also Johnson, Larson, Papageorgiou, & Subramanian, 2013).

In de Vries et al. (2013b), we review the availability and reliability of data on gross domestic product and estimates of employment by economic activity in more detail. Full documentation of the data is available online (www.ggdc.net/asd).

3. Structural Change in Africa: Stylised Facts and Trends

In this section we use the Africa Sector Database to document the main stylised facts and trends in output, employment, and labour productivity across sectors in 11 Sub-Saharan African countries from 1960 onwards. A first stylised fact is that manufacturing expanded strongly during the early period of economic development, roughly from 1960 to 1975. The relative employment share of manufacturing increased from 4.7 per cent in 1960 to 7.8 per cent in 1975. The manufacturing value added share also increased substantially during that period, from 9.2 to 14.7 per cent (unweighted average across 11 countries, see Table 1). This development pattern reflects the classic Lewis-type dual economy model, where workers move out of subsistence agriculture and are absorbed in modern manufacturing (Lewis, 1954). Differences in earnings between traditional and modern sectors are a central feature in accounting for these reallocation dynamics.

The last columns in Table 1 show sector labour productivity levels measured as value added divided by persons engaged. They are relative and calculated as the ratio of the sector level to the total economy level. For example, a relative productivity level of 0.5 for agriculture in 1960 suggests that the average productivity level in agriculture is half that of the total economy. These levels might approximate differences in relative earnings across sectors.⁶ In 1960, productivity in manufacturing was about 2.5 times that of the total economy level (which is mainly determined by agriculture). Its level even increased afterwards and was 2.8 times the average in 1975. This suggests that the average output of workers in manufacturing did not fall relative to other sectors of the economy, despite the rapid employment expansion in this sector.

Perspectives on the success of this industrialisation phase in Africa differ. ‘Structuralists’ emphasise the productivity dynamics, the generation of economies of scale, uptake of new technologies and

Table 1. GDP, employment, and relative productivity levels in Sub-Saharan Africa (unweighted average of 1 countries), 1960–2010

	Value added				Employment				Relative productivity levels			
	1960	1975	1990	2010	1960	1975	1990	2010	1960	1975	1990	2010
Agriculture	37.6	29.2	24.9	22.4	72.7	66.0	61.6	49.8	0.5	0.4	0.4	0.4
Industry	24.3	30.0	32.6	27.8	9.3	13.1	14.3	13.4	4.4	3.7	3.5	2.6
Mining	8.1	6.2	11.2	8.9	1.7	1.5	1.5	0.9	15.7	22.4	23.3	19.5
Manufacturing	9.2	14.7	14.0	10.1	4.7	7.8	8.9	8.3	2.5	2.8	2.4	1.6
Other industry	7.1	9.2	7.3	8.9	3.0	3.8	3.9	4.2	8.5	5.8	5.3	2.9
Services	38.1	40.7	42.6	49.8	18.0	20.9	24.1	36.8	2.7	2.5	2.4	1.6
Market services	24.5	25.5	28.1	34.0	8.8	10.3	12.9	23.5	4.5	3.4	3.0	1.8
Distribution services	21.5	20.8	22.7	25.4	8.2	9.5	11.4	20.1	4.6	3.2	2.7	1.5
Fin. & bus. services	3.0	4.7	5.4	8.6	0.6	0.8	1.5	3.4	6.1	8.9	10.4	8.1
Non-market services	13.6	15.2	14.4	15.8	9.2	10.6	11.2	13.3	1.8	1.7	1.8	1.3
Government services	10.5	11.7	11.5	12.2	3.8	4.5	5.9	7.9	2.6	2.3	2.3	1.6
Other services	3.1	3.5	2.9	3.5	5.4	6.1	5.3	5.4	0.9	0.9	1.0	1.0
Total economy	100	100	100	100	100	100	100	100	1.0	1.0	1.0	1.0

Notes: For some countries time series do not start in the 1960s. For these countries we took the share from the most nearby year (Botswana: 1964; Ethiopia: 1961; Kenya: 1969; Malawi: 1966; Mauritius: 1970; Senegal: 1970; Tanzania: 1961; Zambia: 1965). Figures are unweighted averages across 11 African countries. Other industries include construction and public utilities. Distribution includes transport services and distributive trade as well as hotels and restaurants. Finance and business services exclude real estate activities. Other services include other community, personal and household services. Numbers may not sum due to rounding. Relative productivity level is the ratio of the sector and total economy levels.

Source: Authors' calculations using the Africa Sector Database

manufacturing's prime role in driving technological change throughout the economy. They acknowledge the important build up of capabilities in production, investment and (incremental) innovation activities during this period (Fransman, 1982). Others highlight the costs of heavy government involvement in the economy through an active import-substitution policy. Prices were distorted in favour of industry leading to the development of an inefficient manufacturing sector that was not able to compete in the global market. At international prices, productivity levels might have been much lower than at national prices (Lensink, 1996). Nevertheless, Ellis (2002) has termed it the golden age of African growth performance.

In the 1970s, the region got caught in political and economic turmoil, both at the national and global level. The oil crises in the 1970s, currency instability, and related events resulted in a long period of stagnation. The employment share in industry, which was still low according to international standards, barely rose. The share of agriculture continued to drop slowly, releasing workers to the services sector instead. Between 1975 and 1990, growth was low or negative across the continent, triggering a major process of restructuring and liberalisation through the structural adjustment programmes (Lensink 1996; Collier & Gunning, 1999).

When growth rebounded during the 1990s, structural change resumed and we observe rapid reallocation of workers again. The agricultural employment share fell from 61.6 per cent in 1990 to 49.8 per cent in 2010. What is striking, however, is that manufacturing did not expand during this period. The manufacturing employment share even fell from 8.9 per cent in 1990 to 8.3 per cent in 2010. Page (2012) argues that deindustrialisation after 1990 was accompanied by a declining diversity and sophistication of manufacturing activities, leading to a further erosion of manufacturing capabilities in the region. Workers who were moving out of agriculture were instead absorbed in market services sectors, in particular distribution services (see also Rodrik, 2013b).⁷ Table 1 shows that the share of distribution services almost doubled to 20.1 per cent in 2010. Nowadays, one fifth of Africa's labour force is employed in the distribution sector, which is comparable to levels observed in OECD countries (Jorgenson & Timmer, 2011).

Various reasons for the shift towards services can be given. Market-oriented policy reforms in the 1990s likely increased demand for wholesaling and retailing services. For example, trade liberalisation facilitated the imports of numerous consumer goods and investment good parts, and stimulated the expansion of foreign retail chains through FDI.⁸ More recently, driven by increasing incomes, a relatively larger share of domestic demand is shifting towards consumption of services. For example, Jedwab (2013) has argued that the expansion of natural resource exports, such as cocoa in Ghana, has resulted in ‘consumption cities’ increasing demand for urban services such as trading, transport and personal services.

In contrast to the shift towards industry in the 1960s and 1970s, reallocation of workers to services is not necessarily related to an increase in aggregate productivity. The final columns in Table 1 suggest that the marginal productivity of additional workers in market services was below that of existing activities. This is reflected in the relative productivity level, which fell from 3 times the total economy average in 1990 to 1.8 in 2010. However, the reallocation of workers to market services (wholesale and retail trade, hotels and restaurants services, transport, storage, and communication services, and finance, insurance, real estate and business services) with below average productivity growth suggest that the dynamic implications of structural change were negative after 1990 as we will quantify more formally in the next section.⁹

The reallocation patterns discussed in this section hold for most of the 11 Sub-Saharan African countries analysed. But there is some notable diversity in country experiences. In the Online Appendix the set of information as in Table 1 is presented separately for each country. Manufacturing employment shares increased after 1990 in Botswana, Ethiopia, Kenya, Malawi, Senegal and Tanzania (albeit from a rather low level), whereas the manufacturing employment share fell substantially in other countries in the database, for example by 6.9 percentage points in Nigeria and 2.8 percentage points in South Africa. For all countries, market services employment shares rose after 1990; in Ghana the share of workers in market services expanded from 20.5 per cent in 1990 to 30.2 per cent in 2010; in Zambia, market services almost doubled from 6.8 per cent to 13.2 per cent of the labour force. These findings are in line with country case studies for Ghana and Zambia (Resnick & Thurlow, 2014; Rodrik, 2013b). In the next section, we will seek to quantify the implications of these reallocation patterns for aggregate growth in Africa in a more formal way.

4. Structural Change in Africa: Decomposition Results

To measure the contribution to aggregate growth from the reallocation of workers across sectors of the economy, researchers typically use the canonical decomposition originating from Fabricant (1942). It decomposes the change in aggregate productivity into a within- and a between-effect. The within-effect captures productivity growth within sectors, whereas the between-effect measures the productivity effect of labour reallocation across different sectors. This method was used for Africa by McMillan and Rodrik (2011) and subsequently by Badiane, Ulimwengu, and Badibanga (2012), Garcia-Verdu, Thomas, and Wakeman-Linn (2012), McMillan and Harttgen (2014) and country studies reviewed in Rodrik (2013b).

McMillan and Rodrik (2011) decompose the change in aggregate productivity as follows

$$\Delta P = \sum_i (P_i^T - P_i^0) S_i^0 + \sum_i (S_i^T - S_i^0) P_i^T \quad (1)$$

where S_i is the share of sector i in overall employment, P_i the labour productivity level of sector i , and superscript 0 and T refer to initial and final period. In Equation (1), the change in aggregate productivity is decomposed into within-sector productivity changes (the first term on the right-hand side which we call the ‘within-effect’, also known as ‘intra-effect’, and the effect of changes in the sectoral allocation of labour which we call the ‘between-effect’, (also known as the ‘shift-effect’ or ‘structural-change-effect’). The within-effect is positive when the (weighted) labour productivity growth in sectors is positive. The between-effect measures the contribution of labour reallocation across sectors, being positive when labour moves from less to more productive sectors.

The between term presented in Equation (1) is a static measure of the reallocation effect as it only depends on differences in productivity levels across sectors, not differences in productivity growth. McMillan and Rodrik (2011) state that since 1990 workers in Africa move to low-productivity *growth* sectors, but actually they refer to a finding in the decomposition that is based on productivity *levels*.¹⁰ This distinction is important: expanding sectors might initially have high productivity levels but if additional workers cannot be gainfully employed the marginal productivity of these additional workers will be low, depressing productivity growth rates. This negative correlation might appear when, for example, much of the new employment is in low-tech and/or small-scale informal activities.

An alternative decomposition method that explicitly accounts for the possibility that expanding sectors have low productivity growth rates will be used here. It uses base-period weights for both the changes in employment shares and in the productivity levels. Importantly, this introduces a third term in the decomposition that can be written as follows

$$\Delta P = \sum_i (P_i^T - P_i^0) S_i^0 + \sum_i (S_i^T - S_i^0) P_i^0 + \sum_i (P_i^T - P_i^0) * (S_i^T - S_i^0) \quad (2)$$

The first term on the right-hand side is the within-effect, similar to that in Equation (1). The second term in Equation (2) measures whether workers move to sectors with above-average productivity *levels* (which we will call the between-static-effect). The third term represents the joint effect of changes in sector employment and productivity levels (which we will call the between-dynamic-effect). It is positive (negative) if workers are moving to sectors that are experiencing positive (negative) productivity growth.¹¹

The analysis of African growth looks quite different depending on the approach taken. Between 1960 and 2010 aggregate labour productivity growth in the 11 African countries (unweighted average) was 1.4 per cent per year. According to the traditional decomposition as in Equation (1), the within-effect is positive at 0.8 percentage points and the between-effect accounts for about 0.6 percentage points of growth. Following the decomposition in Equation (2) the within effect is as before. The static between-effect suggests that labour has been moving to sectors with above average productivity levels, accounting for 1.5 percentage points. However, this decomposition shows that sectors that expanded experienced productivity growth that was below the overall economy average. This is reflected in the negative dynamic ‘between-effect’ of –0.8 percentage points. This might happen when the marginal productivity of additional workers in expanding sectors has been below that of existing activities in those sectors.

Our decomposition results suggest that it is conceptually and empirically important to distinguish between static and dynamic reallocation effects, and decomposition Equation (2) will therefore be used in the remainder of the paper.

In the top panel of Figure 1 we consider decomposition results for different periods in Africa’s economic development. During the golden age of Africa’s growth performance, roughly 1960–1975, static reallocation gains were substantial, while dynamic losses were small. We discussed in the previous section that workers moved out of agriculture and were absorbed in manufacturing. Productivity levels in manufacturing were much higher compared to agriculture, and did not decline relative to the rest of the economy. This is reflected in the positive static reallocation effect and the small negative dynamic reallocation effect.¹² Overall, it suggests structural change was growth enhancing and accounts for a substantial part of labour productivity growth.

During the crisis years, from about 1975 to 1990 in most countries, growth stagnated and so did structural change. Productivity growth was sluggish within all sectors. Workers continued to move to higher productivity level sectors resulting in static reallocation gains, but these were small in general. Moreover, dynamic losses were of almost equal size indicating that reallocated workers were not particularly productive in the new activities.

After 1990, the movement of workers out of agriculture (and to some extent out of industry, see Table 1) started to accelerate and services activities expanded; the share of market services workers rose by more than 10 percentage points, from 12.8 in 1990 to 23.4 in 2010. The productivity level in market services was above the average of the total economy. As a result, static reallocation gains

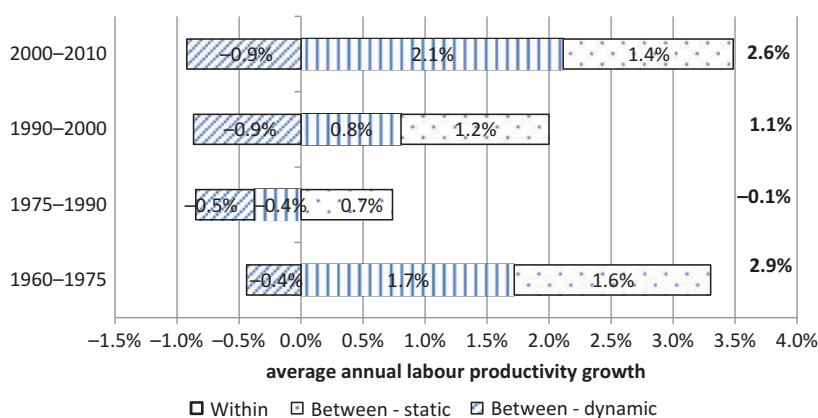


Figure 1. Decomposition results for Sub-Saharan Africa (unweighted average of 11 countries).

Notes: Unweighted average across 11 African countries. For several countries value added and/or employment data for 1960 is missing, see [Table 1](#). For these countries, the decomposition for 1960 to 1975 is actually computed for a shorter time period. Numbers may not sum due to rounding.

Source: Authors' calculations using Africa Sector Database September 2014 release and Equation (2).

account for a substantial part of aggregate productivity growth. However, the marginal productivity of additional workers was low resulting in a negative dynamic reallocation effect. Overall, the combined reallocation effect was small, in line with the finding by McMillan and Rodrik (2011).¹³

One possible interpretation of the negative dynamic effect is that it reflects mainly rapid productivity growth in agriculture, as it basically captures the difference in productivity growth between expanding and shrinking sectors. As surplus labour is released from agriculture, productivity growth in the sector goes up. When this growth is faster than in expanding sectors, the dynamic term will turn negative, and this should not necessarily be seen as a negative development but rather as a new phase in development. However, at the same time it is clear that this development phase can only provide a temporary boost to aggregate growth as long-run growth is driven by activities that have high productivity growth and attract resources at the same time. As shown in [Table 1](#), this dynamic growth process did not start in the 1990s as expanding sectors' productivity performance was sluggish at best.

McMillan, Rodrik, and Verdusco-Gallo (2014) argue that since 2000 the contribution from structural change to growth has increased relative to the 1990s. The 1990s are characterised by structural adjustment with meagre growth rates, while growth accelerated in the post 2000 period, fuelled in part by a resource boom. Indeed, aggregate labour productivity growth accelerated from 1.1 percentage points annually in the first period to 2.6 in the second. However, the big difference in the two periods is the contribution of growth within sectors, increasing from 0.8 percentage points to 2.1.¹⁴ However, also after 2000 the negative dynamic reallocation effect is still large, as workers have been increasingly reallocating to market services activities with low productivity growth.

The decomposition results of productivity growth for each of the 11 African countries during the three periods from 1960 to 2010 are given in [Table 2](#). Additional figures are presented in de Vries et al. (2013a). Structural transformation paths obviously vary widely across countries and the contribution of the various productivity effects varies. For example, within-sector productivity growth is substantial in Ghana and South Africa, but not in Malawi or Senegal after 2000. However, the qualitative contribution of structural change to growth is fairly similar across all countries: in all 11 countries considered, the productivity growth in expanding sectors was below-average during the period 1990–2000 and this continued during 2000–2010. Countries like Ethiopia, Kenya, Nigeria, Tanzania and South Africa had a significant acceleration of aggregate productivity growth after 2000, which is mainly accounted for by increasing productivity growth within sectors. It remains to be seen to what extent this is the result of changes within each sector, perhaps reflecting a shift towards larger scale activities with higher levels of technology. More detailed (firm-level) data is needed to investigate this at the sector level and will provide an important avenue for further research.

Table 2. Decomposition results by country

		Within	Between –static	Between – dynamic	Total growth
Botswana	1964–1975	3.2%	6.0%	–0.6%	8.6%
	1975–1990	4.3%	4.2%	–1.4%	7.1%
	1990–2000	2.1%	–0.2%	–0.5%	1.3%
	2000–2010	4.5%	0.2%	–2.2%	2.5%
Ethiopia	1961–1975	–0.6%	1.5%	–0.6%	0.3%
	1975–1990	–1.9%	0.2%	–0.1%	–1.7%
	1990–2000	–0.6%	1.2%	0.0%	0.6%
	2000–2010	2.7%	2.9%	–1.2%	4.5%
Ghana	1960–1975	–0.7%	–0.1%	–0.2%	–1.0%
	1975–1990	–1.2%	0.0%	–0.1%	–1.3%
	1990–2000	2.8%	0.8%	–0.3%	3.2%
	2000–2010	2.3%	0.8%	–0.5%	2.6%
Kenya	1969–1975	0.6%	0.8%	–0.2%	1.2%
	1975–1990	–0.6%	1.5%	–0.6%	0.3%
	1990–2000	–3.6%	4.3%	–2.8%	–2.1%
	2000–2010	1.2%	0.1%	–0.3%	1.1%
Malawi	1966–1975	1.2%	0.5%	–0.2%	1.5%
	1975–1990	–1.0%	0.2%	–0.3%	–1.1%
	1990–2000	0.5%	2.1%	–1.3%	1.3%
	2000–2010	–0.9%	4.6%	–1.9%	1.8%
Mauritius	1970–1975	11.0%	2.6%	–1.8%	11.8%
	1975–1990	0.3%	1.2%	–0.6%	0.9%
	1990–2000	3.4%	1.2%	–0.2%	4.4%
	2000–2010	2.4%	0.9%	–0.6%	2.7%
Nigeria	1960–1975	4.1%	–0.2%	1.7%	5.6%
	1975–1990	0.7%	–0.7%	–0.4%	–0.3%
	1990–2000	1.4%	–0.5%	–0.4%	0.6%
	2000–2010	3.9%	–0.3%	–0.6%	3.0%
Senegal	1970–1975	–2.9%	0.9%	–0.2%	–2.2%
	1975–1990	–3.2%	1.1%	–0.7%	–2.8%
	1990–2000	0.3%	1.5%	–0.9%	0.9%
	2000–2010	0.6%	1.4%	–0.9%	1.1%
Tanzania	1961–1975	1.2%	4.8%	–3.4%	2.6%
	1975–1990	–0.9%	0.9%	–0.5%	–0.5%
	1990–2000	0.1%	0.9%	–0.3%	0.7%
	2000–2010	0.9%	3.4%	–1.0%	3.3%
South Africa	1960–1975	2.1%	1.3%	0.6%	4.0%
	1975–1990	–1.0%	1.3%	–0.3%	–0.1%
	1990–2000	0.8%	0.5%	–1.2%	0.1%
	2000–2010	2.7%	0.1%	0.0%	2.8%
Zambia	1965–1975	–0.4%	–0.6%	0.1%	–1.0%
	1975–1990	0.3%	–1.7%	–0.3%	–1.6%
	1990–2000	1.6%	1.5%	–1.7%	1.4%
	2000–2010	2.9%	1.1%	–1.0%	2.9%

Notes: decomposition results using Equation (2). *Source:* Africa sector database.

For an international perspective on the Sub-Saharan region, we provide decomposition results across a set of 11 Asian and nine Latin American countries using the updated GGDC 10-sector database (Timmer, de Vries, & de Vries, 2014) in Figure 2. The dynamic reallocation term for Asia is close to zero, which suggests that the rapid reallocation of workers in Asia did not negatively affect productivity growth rates in the expanding sectors, mainly industry (see also Timmer, 2000). In particular during the period from 1960 to 1975 we find a positive dynamic reallocation effect for

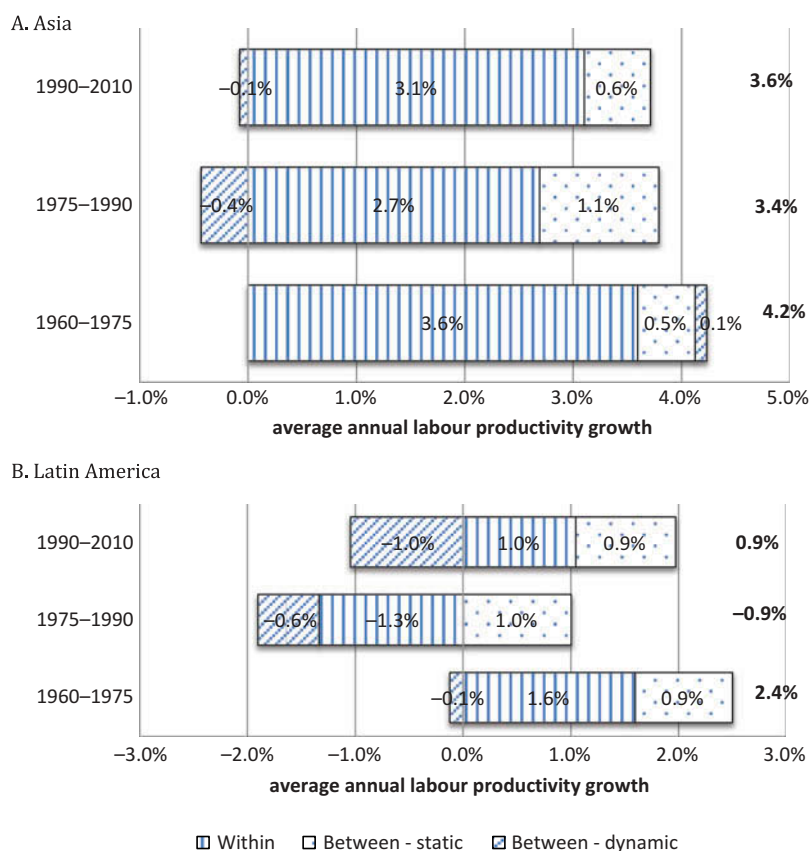


Figure 2. Decomposition results for Asia (A) and Latin America (B).

Notes: decomposition results using Equation (2). Asia includes: China, Hong Kong (China), India, Indonesia, Japan, Korea (Rep. of), Malaysia, Philippines, Singapore, Taiwan, and Thailand. Latin America includes: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru, Venezuela.

Sources: Africa Sector Database; updated GGDC 10-sector database (Timmer et al, 2014).

Asia, despite high productivity growth in agriculture, in contrast to the recent African experience. Patterns of structural change in Africa appear much more comparable to those observed in Latin America. Rapid growth during 1960–1975 was accompanied by a strong process of structural change in which expanding sectors did not suffer productivity growth decelerations. As for Africa, the period 1975–1990 was characterised by stagnation and a slow process of structural change. Growth resumed somewhat after 1990 but it was mainly driven by expansion of market services with above-average productivity levels, but below-average productivity growth. Consistent with findings by the Inter-American Development Bank (IDB, 2010), we find that structural change since 1990 resulted in static gains and dynamic losses for Latin America as well.

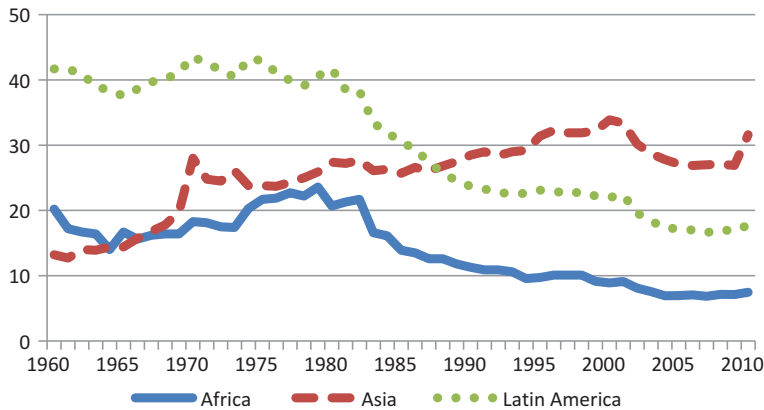
5. Africa's Distance to the Global Productivity Frontier

In recent work Rodrik (2013a) found that productivity convergence in manufacturing was unconditional. Once initiated, diffusion of frontier manufacturing technologies and upgrading of production processes appeared to be automatic for developing countries, and productivity levels will converge to the global frontier. His empirical analysis was limited to the modern (formal) part of the manufacturing sector and it remains to be seen to what extent this is also valid for manufacturing as a whole (including formal and informal) and other sectors in the economy. To compare productivity across

countries, a key issue is how to convert value added into common currency units. Conceptually, the purchasing price parity (PPP) exchange rate is appropriate but as relative prices vary substantially across tradable and non-tradable sectors, we use sector-specific output PPPs provided by Inklaar and Timmer (2013), and also made available in the Africa Sector database (see www.ggdc.net/asd). These are based on expenditure price data collected by the World Bank in the 2005 International Comparison Program (ICP) round except for agriculture, which is based on unit value information from the Food and Agriculture Organization (FAO). Basic headings from the ICP round are matched to sectors that are the main producers of the good or services, see Inklaar and Timmer (2013) for details.

We define the United States as the frontier country and measure labour productivity in our set of 11 African countries relative to this frontier over time. Figure 3(a) shows the productivity levels across Africa, Asia, and Latin America for manufacturing (unweighted average across countries in a region). Not surprisingly, the average level in Africa lies substantially below the United States' productivity level. For manufacturing the sample mean is about 7 per cent in Africa, taking 2010 for comparison. Africa's current manufacturing productivity level is poor also when compared to Asia and Latin America. This was not always the case. During the first period (1960–1975), average productivity was

A. Manufacturing



B. Market services

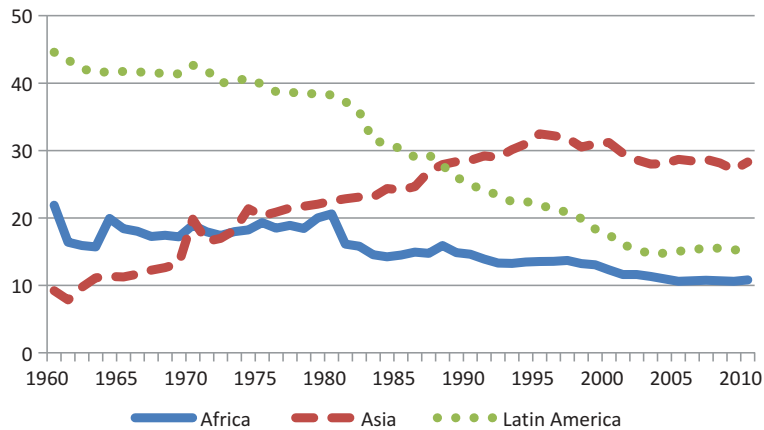


Figure 3. An international perspective on productivity (USA = 100) **A.** manufacturing, **B.** market services. *Notes:* unweighted averages across countries in a region: 11 countries in Africa and Asia and nine in Latin America (see Table 1, Figure 2).

Sources: Authors' calculations using the Africa sector database and the updated GGDC 10-sector database for Asia and Latin America (Timmer & de Vries, 2009), as well as sector-specific PPPs from Inklaar and Timmer (2013).

about 20 per cent of the United States level, which compares to 13 per cent on average for Asia. Also up until the late 1970s, productivity trends were in line with growth at the United States frontier. This suggests that during the period 1960–1975 the expansion of manufacturing activity in Africa compares relatively well in an international perspective. However, much manufactured products were only destined for domestic markets and not internationally competitive.¹⁵ In contrast to Rodrik (2013a) we do not find automatic convergence in the manufacturing sector. His analysis was restricted to the formal part of manufacturing, using data for medium and large sized firms. The numbers here show that a major part of manufacturing in Africa still consists of informal, small-scale and low productive firms with low levels of technologies (see also Rodrik, 2013b).

Panel B shows comparisons of labour productivity in market services (wholesale and retail trade, hotels and restaurants services, transport, storage, and communication services, and finance, insurance, real estate and business services). In the previous section we observed that market services expanded rapidly after 1990 while productivity growth was slow. When viewed from an international perspective, the productivity performance of Africa's market services sectors appears to be even more disappointing, and not holding up to that at the frontier since the 1990s.¹⁶ Figure 3(b) suggests that productivity in market services fell further behind the frontier during a period in which its employment expanded rapidly. Part of the services sector in Africa has underwent rapid changes and achieved high productivity growth, such as the telecommunications sector. But the global revolution in wholesaling and retailing activities made possible by deployment of advanced ICT technologies has barely started.¹⁷

6. Concluding Remarks

Comparative research on growth and structural transformation in Africa has typically been confined to the post-1990 period.¹⁸ This paper puts the African growth experience in a long-run and international perspective and focuses on the movements of labour across sectors and its impact on aggregate productivity growth. Clearly, this is only one, albeit important, aspect of the structural change process taking place in African economies, which include changes in savings and investment rates, urbanisation, demographic transitions, changes in income inequality, and more broadly changes in institutional frameworks. At the same time this parsimonious approach allows us to study several salient characteristics in detail. We show that current development patterns in the 11 African countries analysed differ markedly from that in earlier periods. During the high-growth period from 1960 to 1975, Africa took a step forward by expanding its manufacturing activities. Although this took place behind high tariffs and with active government support, it was related to growth enhancing structural change as manufacturing productivity improved and rudimentary technological capabilities were developed. In contrast, in the 1990s activities in market services, such as trade, transport, communication and business services, expanded; while productivity levels in these sectors were above the economy average, productivity growth was not and it fell increasingly behind the global frontier. Therefore, we observe static reallocation gains but dynamic losses. This pattern compares unfavourably to Africa's earlier period of high growth as well as to the periods of rapid growth in Asia in the past.

The analysis in this paper is based on the new Africa Sector Database, which is publicly available and free of charge at www.ggdc.net/asd. The dataset includes annual time series of value added and persons engaged for the 10 main sectors of the economy. It extends McMillan and Rodrik (2011) covering 11 countries in Sub-Saharan Africa during the period 1960 to 2010. The quality of Africa's national account and employment statistics certainly lags behind those of more advanced countries (Jerven, 2013; Jerven & Johnston, 2015), but improvements are being made. For example, recent revisions to the national accounts statistics in Nigeria and Ghana illustrated the out-dated nature of measurement systems and sample frames, and introduced improved estimates. Going forward, better measures are to be expected for current periods, as well as for more historical periods (Frankema & Waijenburg, 2012). The Africa Sector Database provides a good starting point and will be updated regularly to incorporate this.

Clearly, a deeper understanding of the forces underlying structural transformation in Africa's recent growth period is needed. Future work should focus on the structure of production and aim to capture the interlinked nature of the economy, both domestically and internationally. The framework in this paper is not suitable for analysing inter-industry linkages and spillovers in the tradition of Hirschman (1958). For example, improvements in distribution services might stimulate domestic manufacturing activities by development of local or regional value chains. And similarly, telecommunication and financial and business services might have high spillover potential for producers and consumers. Such analysis requires an input-output framework and further data-development in the tradition of Chenery et al. (1986). Of particular importance is the role of global value chains that provide a pipeline for investment, technology and global market access for African firms. While this type of analysis is feasible for advanced countries, additional database construction efforts are needed to extend it to Africa (OECD, 2014). Future research should also aim to analyse the role of resource reallocation for aggregate growth building up from the micro-level such as in Shiferaw and Bedi (2013) for Ethiopia. Crucially, that might allow one to observe the changes in marginal productivity of workers that reallocate across firms. Indeed, the increasing availability of micro data opens up a promising research agenda that will provide deeper insights into the sources of African growth.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

Notes

1. McMillan et al. (2014) argue that there has been a turnaround in Africa from growth-reducing structural change during the 1990s to growth-enhancing structural change since 2000. This will be discussed in [section 4](#).
2. The upward revision of Ghana's GDP by about 60 per cent in 2006 and the 89 per cent increase in Nigeria's GDP in 2014 are notable examples. Changes for Ghana and Nigeria partly relate to the inclusion of services activities in GDP that were previously not covered. For Ghana, several communication and personal services, recreation services, and professional services were not included in GDP before the revision. Nigeria did not include many telecommunication services and media activities in its GDP before the revision.
3. In most developing countries a fixed-base Laspeyres volume index is used.
4. Because of the application of fixed-base Laspeyres volume indexes by most statistical offices, additive consistency is lost and linked sectoral GDP therefore do not add up to total GDP for earlier periods.
5. The preferred age boundary is 15 years and older, however for some countries the age boundary differs, see de Vries et al. (2013b).
6. In this paper we do not directly observe marginal productivity, but measure average productivity across sectors and over time. If a production function is Cobb Douglas, the marginal productivity of labour is average productivity times the labour share in value added. If labour shares differ across sectors, an analysis based on average productivity may be misleading. For example, high average productivity in a capital-intensive sector may simply reflect a low labour share. We assume that marginal and average productivities have a strong positive correlation. Gollin et al. (2014) found that differences in average

- productivity in agriculture and manufacturing are related to large gaps in marginal productivity, giving some credibility to the approach adopted here. However, there is a clear need for further research in this area.
7. Distribution services include wholesale and retail trade, hotels and restaurants, and transport services.
 8. We thank one of the referees for pointing this out to us.
 9. One might argue that when workers move towards market services, it becomes more labour-intensive and as a result the capital-labour ratio and also labour productivity decline. Typically the reallocation of workers requires additional investment in order for average products in expanding sectors not to change (Chenery et al., 1986).
 10. For example, McMillan and Rodrik (2011) state ‘When changes in employment shares are positively correlated with productivity levels, this term will be positive, and structural change will increase economy-wide productivity growth’ (p. 13).
 11. One might argue that the interaction term does not fully reflect structural change, as it interacts changing employment shares with productivity changes. However, the structural change term in Equation (1), used by McMillan and Rodrik (2011) can be split into the second and third term of Equation (2). Hence, the structural change term used by McMillan and Rodrik (2011) combines the static and dynamic reallocation effect. We will show that it is important to make this distinction in order to understand differences in the role of structural change for growth between the period 1960 to 1975 and the period 1990 to 2010.
 12. Typically the dynamic reallocation effect is negative (but small) as it is difficult to absorb additional labourers at the same rate of marginal productivity, for example due to adjustment frictions or organisational restructuring, see van Ark (1996) for Europe, and Timmer (2000) for Asia.
 13. In Appendix B of de Vries et al. (2013a) we describe the main differences in data sources compared to McMillan and Rodrik (2011). The most notable differences are the inclusion of updated national account data for Ghana, Ethiopia, Botswana, and Zambia, and the use of new population census or labour force survey data for Nigeria and Malawi.
 14. These numbers correspond closely to the unweighted average reported in McMillan et al. (2014).
 15. It should be noted that we assume that PPPs for gross output are representative for value added. More specifically, we are not able to correct for differences in prices of intermediate inputs. If intermediate input goods were heavily subsidised value added might be over estimated. This was common practice in various African countries during the period of import substitution industrialisation (Szirmai, 2005).
 16. Faster productivity growth in US market services is partly related to differences in accounting for price changes in retail output (Inklaar & Timmer, 2008). The United States statistical office uses a quality-adjusted price deflator, especially for the consumption of information and communication technology goods. Measured sales volumes are smaller in most African countries, partly because they do not make use of hedonic price deflators.
 17. This is, for example, observable from the low levels of spending on information and communication technologies by wholesale and retail firms in African economies (WITSA, 2010). The opportunities from the use of ICT in wholesale and retail firms are substantial; see Triplett and Bosworth (2004).
 18. Ndulu, O’Connell, Bates, Collier, and Soludo (2008) is a major exception; although different in focus.

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