RESEARCH STREAM
Addressing Africa’s youth unemployment through industries without smokestacks

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Job creation for youth in Africa

Assessing the potential of industries without smokestacks

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Abstract
In several African countries, employment growth has not followed the robust economic growth of recent years. A premature leveling-off of manufacturing and a weak structural transformation dynamic are confining African economies to low-productivity sectors and limiting the prospect of large-scale formal-sector job creation. However, as documented by Newfarmer, Page, and Tarp (2018), there is emerging evidence that some industries—including tourism, agro-industry, horticulture, transport, and information technology-enabled services—are generating opportunities for job creation and more rapid structural transformation in Africa. These "industries without smokestacks" (IWOSS) present characteristics similar to manufacturing, such as being tradable, employing low and moderately skilled labor, having higher-than-average value added per worker, and exhibiting capacity for technological change and productivity growth. In this paper, we assess the job creation potential of industries without smokestacks by estimating employment-to-output elasticities. The results indicate that IWOSS have an employment-to-output elasticity of 0.9, similar to that of manufacturing (0.8), but higher than the 0.6 estimated elasticity for the aggregate economy. Taken at face value, these estimates suggest that there is great scope for IWOSS to be highly employment generating, and that policies supporting an environment conducive to their development could be effective at addressing Africa's youth unemployment challenge.

1. Introduction

While the 1980s and 1990s were generally seen as "lost decades" for Africa, subsequent years have witnessed impressive growth achievements, where real GDP growth rates surpassed those of many other developing regions of the world. Real GDP increase in Africa in the 2000s was more than twice the growth rates of the 1980s and the 1990s, making Africa one of the fastest-growing regions in the world (McKinsey Global Institute, 2016). Indeed, Fox et al. (2013) characterize the period since the mid-1990s as the longest continuous growth stretch in over 50 years, even surpassing that of the low- and middle-income Asian countries during the same period. Notably, the decline in growth rates observed in the 2010s mainly affected resource-rich countries rather than oil-importing ones. A large set of factors contributed to this performance, including greater urbanization (cities being more productive that rural areas), a fast-growing labor force, accelerating technological change, a continued abundance of resources, and growing household and business-to-business spending (McKinsey Global Institute, 2016). In his study, Barthelemy (2018) identifies growth accelerations in 33 out of 50 African countries covered and a dozen countries with multiple growth spikes, which increased their per capita GDP by 158 percent on average.

These growth performances contrast with dismal job creation due to factors on both the supply and the demand sides (Mbaye and Gueye, 2018; Golub and Mbaye, 2019). On the supply side, a booming population driven by the highest fertility rates in the world and improved health outcomes has led to exponential growth in the working-age population. On the demand side, economic growth in Africa continues to be driven mainly by commodities and mineral rents whose labor-absorbing and poverty-reducing potentials are very weak. While agricultural productivity in Africa is quite low, the natural resources sector is inherently capital intensive, employs very few people, and generates few spillover effects in local economies. The growth of other formal activities is deterred by an unfriendly business environment with high unit costs and an often-corrupt bureaucracy (Golub, Celowski, and Mbaye, 2015; Gelb et al., 2018).

A weak structural transformation dynamic and the premature leveling-off of manufacturing is confining African economies to low-productivity sectors (Rodrik, 2015), ultimately altering Africa's capacity to generate decent jobs. Africa's manufacturing output has stagnated at around 10 percent of GDP since the 1970s; the employment share in manufacturing is even lower. Employment has moved from agriculture to low-productivity services sectors unconnected to international markets and with limited potential for productivity growth. More broadly, premature deindustrialization suggests that today's developing countries, including those across Africa, will need to explore alternative development models unlike the well-trodden one based on manufacturing.

Recent contributions in the structural transformation debate have emphasized that "industries without smokestacks"—sectors that share key firm characteristics with manufacturing, such as being tradable, employing low and moderately skilled labor, having higher-than-average value added per worker, exhibiting capacity for technological change and productivity growth, and displaying evidence of agglomeration economies—can serve as a strong alternative to manufacturing in boosting growth and creating good jobs. Newfarmer, Page, and Tarp (2018) identify agro-industry, horticulture, tourism, business services, transit trade, and some information and communications technology (ICT)-based services as these industries without smokestacks.

The purpose of this paper is to contribute to the debate on structural transformation and employment generation in Africa by exploring the role that industries without smokestacks can play in this process.

Industries without smokestacks sectors have shown significant growth in many African countries over the last two decades. Looking at export data, these sectors grew faster than other non-mineral exports for more than half of 33 African countries between 2002 and 2015 (Newfarmer, Page, and Tarp, 2018). Export growth was highest in small- and medium-sized exporters (Lesotho, Sierra Leone, and Burkina Faso). Taking unweighted averages, in 2015, industries without smokestacks accounted for 58 percent of non-mineral exports—up from 51 percent in 2002 (Newfarmer, Page, and Tarp, 2018). For example, the share of horticulture in agricultural exports for Africa increased from 10 percent in 1988 to 22 percent in 2014 (Fukase and Martin, 2018).

Rapid productivity growth is a key feature of the structural transformation process, and tradeable services sectors are increasingly leading within-sector productivity growth in many African countries. A recent analysis by the Overseas Development Institute finds that services sectors contributed more than 50 percent to labor productivity growth in 15 out of 25 countries covered (Newfarmer, Page, and Tarp, 2018). Analysis of tax data in Uganda and Rwanda between 2010 and 2015 showed that services made up a majority of the top 30 industries with the highest labor productivity growth (Spray and Wolf, 2018).

If industries without smokestacks are to serve the same role manufacturing has in the structural transformation process elsewhere in the world, their ability to create jobs will be key. While Newfarmer, Page, and Tarp (2018) explore the value added and productivity growth of these sectors, less is known about their ability to create jobs. The aim of this paper is to estimate the employment intensity of industries without smokestacks and compare it to that of traditional manufacturing and the overall economy.

The remainder of the paper is organized as follows. Section 2 reviews key factors behind weak formal sector job creation in Africa. Section 3 presents data sources and briefly summarizes economy-wide output and employment trends since the 1990s, focusing on industries without smokestacks sectors in particular. Section 4 describes the methodology used to compute employment elasticities. Section 5 presents employment elasticities for several industries without smokestacks along with those for manufacturing and the whole economy. The final section concludes.

2. Africa’s jobless growth

As discussed in section 1, strong economic growth since the early 2000s has not been accompanied by strong job creation in Africa. During 2000-2014, the average employment elasticity in African countries was 0.41, lower than the ideal of 0.7 that would allow for both employment and productivity growth (AfDB, 2018). Limited formal sector job creation has pushed employment to the informal sector, which continues to grow as Africa experiences a demographic boom. Formal sector jobs account for less than 20 percent of employment in most African countries with the share increasing as per capita GDP rises (Fields, 2019). According to Stampini et al. (2013), 10 percent of labor market entrants find a wage job in the private sector while another 10 percent work in the public sector in most African countries.

Low employment quality and underemployment in the informal sector are a challenge in most African countries. The low quality of employment is captured by high rates of vulnerable employment, which include own-account workers and contributing family members. In 2017, according to ILO data, 74 percent of workers were classified as being in vulnerable employment in sub-Saharan Africa, only slightly lower than the 77 percent in 2000 (World Bank, 2019). Low earnings, difficult working conditions, and inadequate social security coverage are key characteristics of vulnerable employment.

This challenge of low employment quality is evident in the ongoing process of structural transformation in Africa. Jobs have moved from agriculture to low-productivity services, bypassing manufacturing, which was key to East Asia's structural transformation. During 2000-2010, the share of agricultural employment declined by about 9 percentage points in eight low-income countries, with two-thirds of that decline moving into services (Diao, McMillan, and Rodrik, 2017), which are characterized by a high level of informality and lower-than-average productivity (de Vries, Timmer, and de Vries, 2015).

Both demand- and supply-side factors are contributing to the limited formal sector job creation in Africa. On the demand side, economic growth has been driven by the capital-intensive commodities sector in many countries, which leads to limited spillovers in the local economy. Infrastructure deficits, corruption, and weak regulatory environments are regularly cited as constraints by African firms that raise costs and reduce competitiveness. For example, despite lower wages, relative unit labor costs for manufacturing firms in most African countries are higher than that for competitors in Asia (Ceglowski et al., 2015).

African countries face infrastructure constraints in several areas including roads, power, and high-speed internet. Electricity shortages limit entrepreneurial activity, reduce output, lower productivity, and limit export competitiveness (Mensah, 2018). Progress in improving electricity generation and transport has been limited, as power capacity per capita has barely increased in the past 20 years, and road density has actually declined. Poor transport infrastructure increases shipping time and trade costs, reducing intra-African and international exports. Bringing sub-Saharan Africa's infrastructure to the global (excluding the region) median in both quantity and quality can increase per capita GDP growth by 1.7 percentage points (World Bank, 2017).

On the supply side, high population growth rates are straining education infrastructure and quality. Although education levels in sub-Saharan Africa have increased significantly over the last two decades, they remain relatively low, with only 70 percent of children completing primary school in 2011. Notably, the likelihood of formal sector employment tends to rise with education levels, with almost 40 percent of those in wage employment with contracts having post-secondary education (Filmer and Fox, 2014). Another contributing factor to unemployment is the mismatch between the skills demanded and the skills available in the labor market, as education curriculums are not adapting fast enough to evolving labor demands, and on-the-job training opportunities are not sufficient to bridge the skills gaps.

3. Data sources and trends in employment and output

One important caveat in using cross-country comparable data at the sectoral level on value added and employment is the weak quality of such available data. Employment statistics in developing countries are known to be inconsistent. In countries with a substantial informal sector, the poor data quality is compounded by the lack of visibility inherent within the informal nature of firms. Besides computing standard elasticities for aggregate sectors, industries without smokestacks are singled out, as these sectors are expected to have high job creation potential. Data availability is even more limited for these sectors.

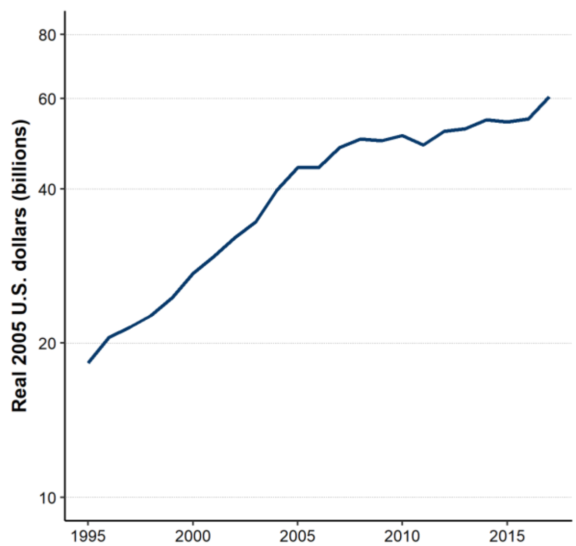
Given these limitations, several different sources are used to compile data for industries without smokestacks. We use the Expanded Africa Sector Database (EASD) from UNU-MERIT and the 10-sector database from the Groningen Growth and Development Center (GGDC) for national data along with manufacturing, and transport and telecom (T-T) industries. We rely on data from the World Travel and Tourism Council (WTTC) for tourism and the UNIDO INDSTAT database for agro-industry. Data for all sectors are presented in constant 2005 U.S. dollars. See Appendix B for a more detailed discussion of data sources.

Trends in output and employment for industries without smokestacks are discussed below.

Tourism

Data for tourism is challenging as the sector is a mix of businesses across various sectors that are measured separately. A major drawback of the data is that only four African countries have ever produced country estimates for value added and employment, leading to data for others being estimated. Estimates produced by the World Travel and Tourism Council (WTTC) combine country reported data based on established U.N. methodology with estimates based on "the typical relationship between the missing information and other economic and Travel & Tourism indicators" (see Appendix B for more details).

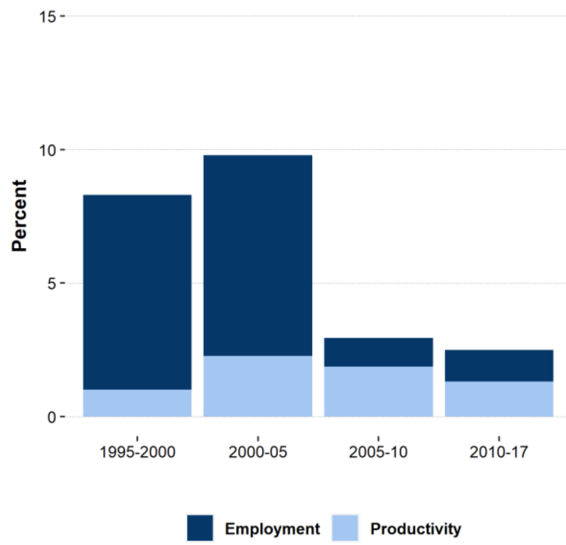
Figure 1: Tourism value added in Africa, 1995–2017



Source: Authors' calculations using data from the World Travel and Tourism Council.

Figure 1 shows the overall upward trend in tourism value added from 1995 to 2017 in the 43 African countries for which data are available. Following a decade of rapid growth, the sector has slowed considerably since 2005, partly affected by the slowdown in the global economy. Following the global economic crisis there was a 4 percent decline in international tourist arrivals and a 6 percent decline in revenues (UNWTO and ILO, 2013). The impact on high-value tourism was particularly significant, with arrivals from high spending markets declining more. For example, in Tanzania, international arrivals only dropped by 5 percent, but led to a 9 percent decline in revenues (UNWTO and ILO, 2013).

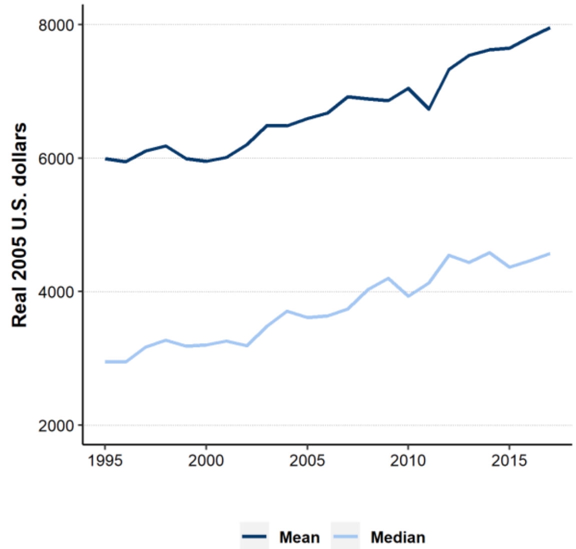
Figure 2: Value added growth decomposition for tourism in Africa, 1995-2017



Source: Authors' calculations using data from the World Travel and Tourism Council.

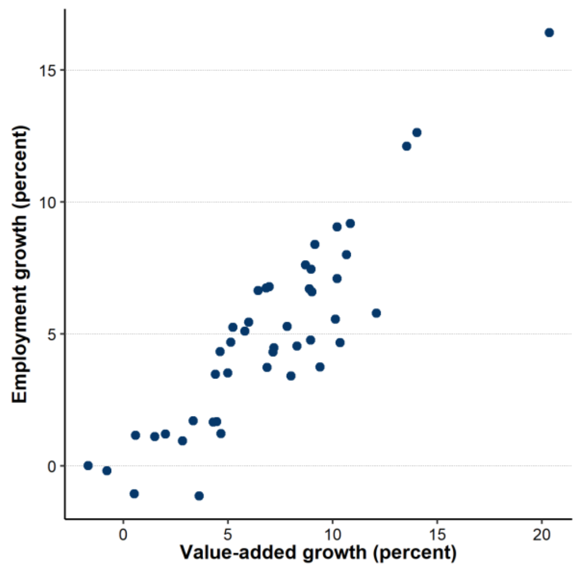
In the 1995-2005 period, tourism's value-added growth was driven more by employment and less by productivity growth (Figure 2). Starting from 2005 until 2017, not only did the tourism value added growth rate plummet, but productivity growth outpaced employment growth, which has become only a very tiny component of tourism value added growth. Not surprisingly, then, tourism labor productivity—both the mean and median—has steadily increased over time (Figure 3). Figure 4 also suggests that, for tourism, growth in employment is associated with growth in value added.

Figure 3: Tourism labor productivity in Africa, 1995-2017



Source: Authors' calculations using data from the World Travel and Tourism Council.

Figure 4: Tourism value added and employment growth in Africa, 1995-2017



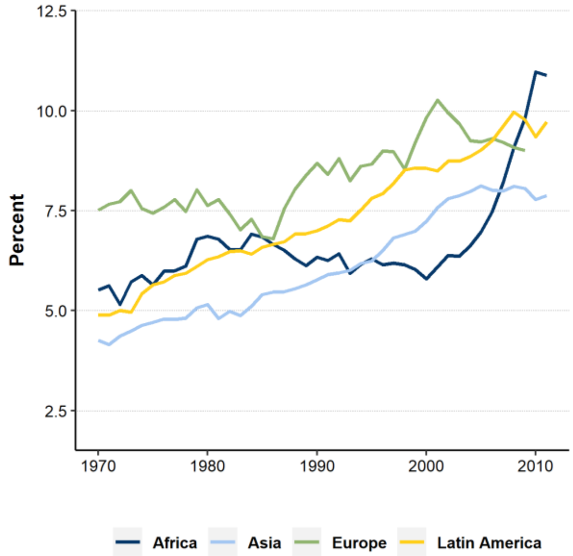
Source: Authors' calculations using data from the World Travel and Tourism Council.

Transport and telecom

Data for transport and telecom (T-T) come from the EASD and GGDC data sets. The EASD covers 18 sub-Saharan African countries while the GGDC has data for Morocco, Egypt, and comparator countries (see Appendix B for more details).

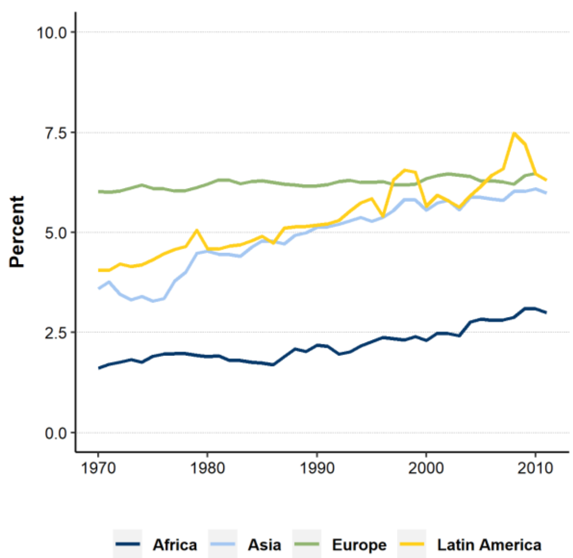
Like tourism, T-T has experienced a steady increase in its share of value added over the 1970-2015 period as a whole (Figure 5). One striking observation is that, since 2000, Africa's growth of value added in T-T has been much faster than that of comparator regions, even other developing regions. In contrast, when it comes to employment share, the situation is reversed (Figure 6). Trends confirm Page and Tarp's argument that industries without smokestacks, of which T-T is an important component, offer similar opportunities as traditional manufacturing in sustaining growth and jobs.

Figure 5: Transport and telecom sector share of GDP by region (median), 1970-2011



Source: Authors' calculations using data from the Expanded Africa Sector Database and the GGDC 10-Sector Database.

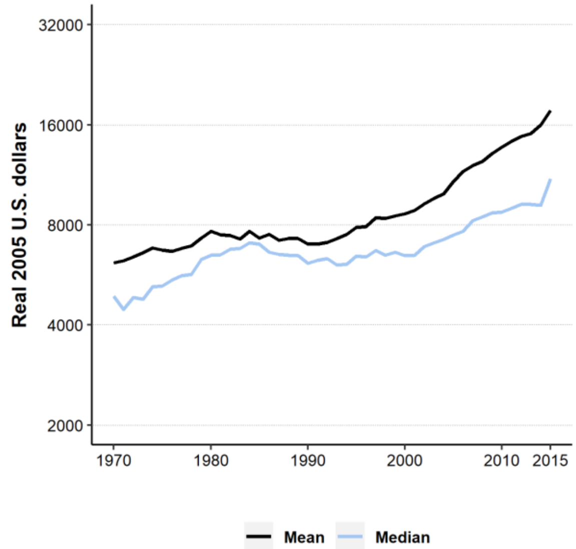
Figure 6: Transport and telecom sector share of employment by region (median), 1970-2011



Source: Authors' calculations using data from the Expanded Africa Sector Database and the GGDC 10-Sector Database.

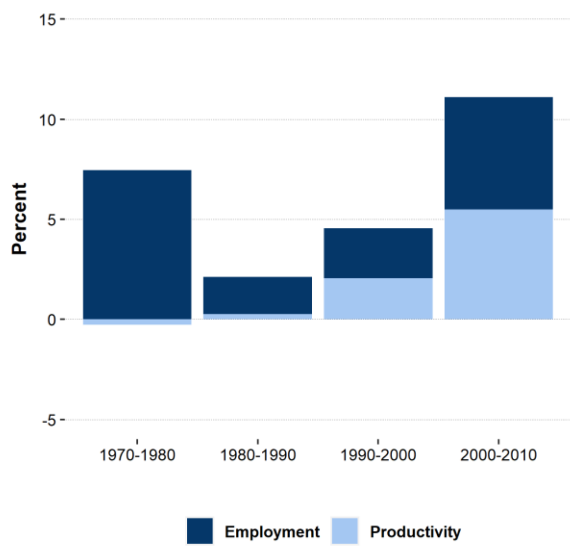
Figure 7 shows a steady increase in T-T's labor productivity over the sample period, except for the interval of 1985-1995. The 1970-1980 and 1980-1990 periods are marked by employment growth outpacing productivity growth (Figure 8). In subsequent periods, employment and productivity grow at about the same pace for Africa.

Figure 7: Transport and telecom labor productivity in Africa, 1970-2015



Source: Authors' calculations using data from the Expanded Africa Sector Database and the GGDC 10-Sector Database.

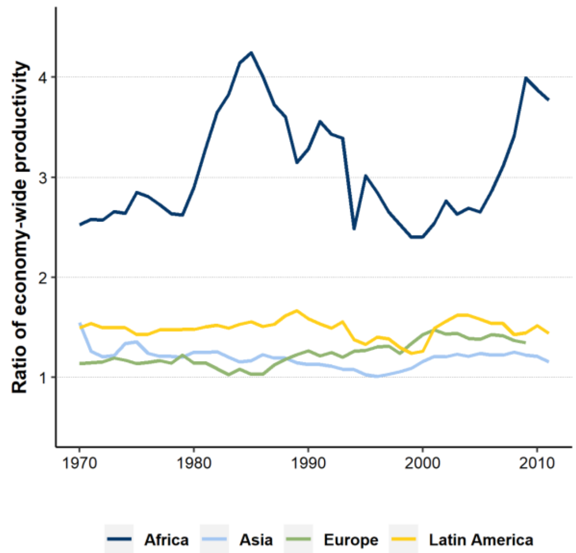
Figure 8: Transport and telecom value added growth in Africa, 1970-2010



Source: Authors' calculations using data from the Expanded Africa Sector Database and the GGDC 10-Sector Database.

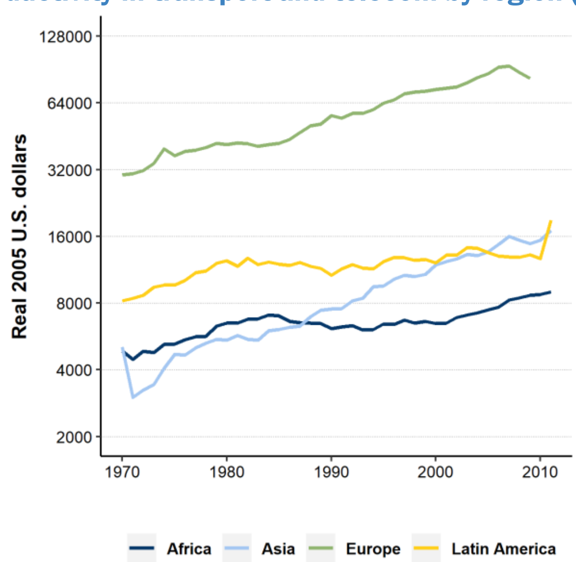
Figure 9 presents relative labor productivity in Africa and comparator developing regions. Notably, in comparison to other regions, Africa's relative productivity exhibits a significantly more erratic trend. Another striking observation is the high magnitude of relative labor productivity in Africa, indicating that the spread between productivity in T-T and the aggregate economy is higher for Africa than for comparators, reflecting an overall lower level of total productivity in Africa than in other developing regions. By contrast, labor productivity is lower in Africa than in other regions (Figure 10). It was higher than in Asia for most of the 1970-1990 period, but then a widening gap between both regions, in favor of Asia, set in, which saw Asia's productivity soar, while Africa's first stagnated, and then slowly increased. Figure 11 presents a clear upward sloping trend of value-added growth-generating employment in Africa.

Figure 9: Relative labor productivity in transport and telecom by region (median), 1970-2011



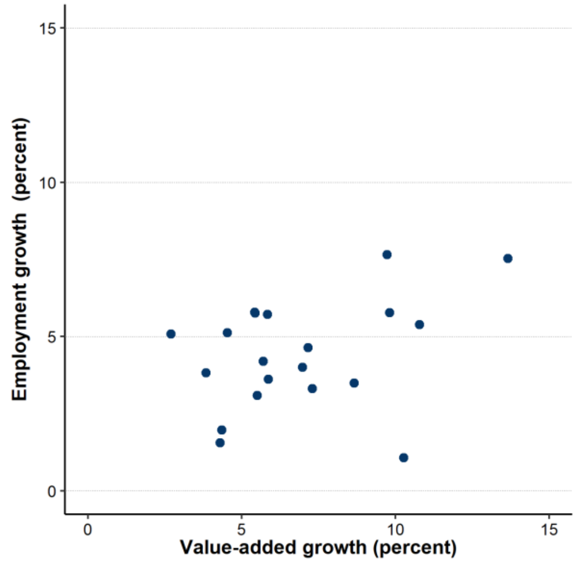
Source: Authors' calculations using data from the Expanded Africa Sector Database and the GGDC 10-Sector Database.

Figure 10: Labor productivity in transport and telecom by region (median), 1970-2011



Source: Authors' calculations using data from the Expanded Africa Sector Database and the GGDC 10-Sector Database.

Figure 11: Transport and telecom value added and employment growth in Africa, 1970-2015



Source: Authors' calculations using data from the Expanded Africa Sector Database and the GGDC 10-Sector Database.

Horticulture

Horticulture is defined as the "cultivation, processing, and sale of fruits, nuts and vegetables, ornamental plants, and flowers as well as many additional services" (Shyr & Reilly, 2017). Other products typically associated with the horticulture industry are coffee, tea, cocoa, spice crops, nuts, and dates (Bhorat et al., 2019). Disaggregated employment and value-added data are not available for the sector as it is included within the broader agriculture sector. Given this limitation, we use export data as a proxy for output to analyze the sector's growth in recent years. Under the definition provided by Bhorat et al., ISIC Rev 3 codes 112 (vegetables, horticultural specialties and nursery products) and 113 (fruit, nuts, beverage, and spice crops) broadly cover the horticulture sector. We use crosswalk tables from the World Bank's World Integrated Trade Solution platform to identify trade codes corresponding to the ISIC industry classification and use trade data from the BACI International Trade Database.[1]

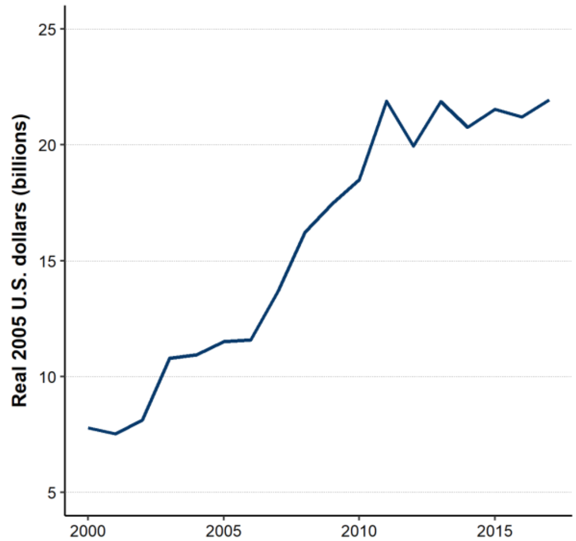
Africa's horticulture exports increased from approximately $8 billion in 2000 to $22 billion in 2017 in constant 2005 U.S. dollars for the 45 countries covered (Figure 12). Horticultural exports grew at 6 percent annually during this period. Africa's share of global horticultural exports increased marginally from 10 percent to 12 percent over this period. In 2017, on average, horticultural exports made up almost 20 percent of non-resource merchandise exports for African countries.[2] Key horticultural exports include cocoa beans ($5.7 billion), citrus fruits ($2.6 billion), nuts ($1.8 billion), coffee ($1.6 billion), and tea ($1.4 billion).

A fast-growing sub-sector in African horticulture is the cut flower industry. Exports have grown from $300 million in 2000 to over $800 million in 2017, making it one of the region's top-10 horticultural export sub-sectors. Kenya and Ethiopia are leading global flower exporters and

[1] 6-digit 1996 Harmonized System trade data.
[2] Unweighted averages. Aggregated by total trade, horticultural exports made up 11 percent of all non-resource exports in 2017.

account for more than 80 percent of African flower exports. Africa's share of global flower exports has increased from 7 percent in 2000 to 12 percent in 2017.

Figure 12: Horticulture exports from Africa, 2000-2017



Source: Authors' calculations using data from the BACI International Trade Database.

Agro-industry

Data for agro-industry come from the United Nations Industrial Development Organization's (UNIDO) INDSTAT 2, Revision 3 database. Following da Silva et al. (2009), we define agro-industry as a component of the manufacturing sector and includes ISIC codes 15-21. Thus, agro-industry includes food and beverages, tobacco products, textiles and apparel, leather products, paper, and wood products. The UNIDO data include both value added and employment and are available from 1963 to 2016.

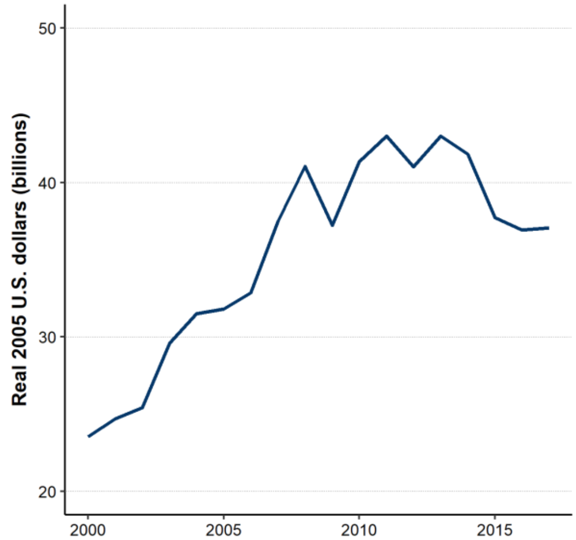
The UNIDO data face two significant limitations. First, for any given year, data for all agro-industry subgroups are not necessarily available. Furthermore, this availability changes throughout the sample period, leading to multiple distinct agro-industry groupings for many countries and then limiting the comparability of agro-industry as a whole from the beginning to the end of the sample for many countries. For several countries, there are multiple elasticity estimates for agro-industry due to the challenges mentioned above. Second, UNIDO aggregates data collected by national statistical agencies that use different methodologies and definitions for the businesses covered, making cross-country comparisons difficult as some countries exclude informal and small businesses from data collection.

Agro-industry plays an important role in the manufacturing sector in developing countries. In Africa, the sector accounts for more than half of manufacturing output in many countries, higher than in Latin America and Asia. As countries develop, agro-industry's share of the manufacturing sector tends to decline, with agro-industry averaging 15 percent of the manufacturing output in developed economies (UNIDO, 2012).

Given the challenges with UNIDO data mentioned above, we use exports as a proxy to analyze output growth in the sector. We use the same process applied for the horticulture sector to identify relevant trade codes from the ISIC industry classification. As Figure 13 shows, agro-industry exports have grown from $24 billion in 2000 to $37 billion in 2017 in constant 2005

U.S. dollars. Most of this growth occurred during 2000 to 2008, when exports hit $41 billion. Since then, export growth has been erratic, with several years during which agro-industry exports actually declined.

Figure 13: Agro-industry exports from Africa, 2000-2017



Source: Authors' calculations using data from the BACI International Trade Database.

In 2017, clothing and apparel, processed fish and meat, cocoa products, wood products, and sugar confectionary products were the five largest agro-industry exports from Africa. Morocco, South Africa, and Egypt account for about half of the region's agro-industry exports with six other countries also having more than $1 billion in annual agro-industry exports.

4. Methodology

Computing employment elasticities is a common way of looking at employment-generating growth patterns. These elasticities measure the responsiveness of employment to value added growth. The relationship between employment elasticity, output growth, and productivity can be a bit more complex. While high employment elasticities are indicative of employment-generating growth, they are also usually associated with a low level of productivity growth. In general, if the value of employment elasticity is found to be *x*, it means that a 1 percent growth in value added is associated with *x*% growth in employment and a productivity increase of (1-*x*)%, everything else being held constant. In other words, a gain in employment elasticities is always obtained at the expense of productivity growth. The following table from Kapsos (2005) illustrates how elasticities can be interpreted with respect to both productivity and employment growth.

Table 1: Interpreting employment elasticity with respect to the sign of GDP growth

	GDP growth	
Employment elasticity	**Positive GDP growth**	**Negative GDP growth**
$\varepsilon < 0$	(-) employment growth (+) productivity growth	(+) employment growth (-) productivity growth
$0 \leq \varepsilon \leq 1$	(+) employment growth (+) productivity growth	(-) employment growth (-) productivity growth
$\varepsilon > 1$	(+) employment growth (-) productivity growth	(-) employment growth (+) productivity growth

Source: Kapsos (2005).

Khan (2001) estimates that an elasticity of 0.7 is compatible with a satisfactory level of productivity growth. To avoid productivity growth reducing employment, value added needs to increase more than productivity. Developing countries are usually price-takers on global markets, and therefore face highly elastic demand for their exports. Consequently, an increase in productivity is likely to boost competitiveness (through decreasing unit labor costs), and therefore increase market shares (Mbaye and Golub, 2003).

The relationship between employment and productivity growth is also evident from the decomposition approached used in the Job Generation and Growth (JoGGs) decomposition tool (World Bank, 2010). In that framework, GDP per capita is decomposed as follows:

$$\frac{Y}{N} = \frac{Y}{E}.\frac{E}{A}.\frac{A}{N}$$

Which yields: $y = \omega.e.a$

Where: *Y* is total output, *E* is employment, *A* is working-age population, *N* is total population, *y* is labor productivity, *w* is output per worker, *e* is employment rate, and a is the dependency ratio. Using this framework, many authors (e.g., Ajakaiye et al., 2016) decompose aggregate productivity into the three components, highlighting the contribution of sectoral employment shares. The very notion of employment elasticity as an indicator of employment-generating growth can be traced to Okun's law (Okun, 1962; Ball, Leigh, and Lougani, 2013), which relates GDP growth to employment growth.

Critics challenge this demand-side approach of job dynamics in which job creation is linked to the rise of output. They argue that that the relationship seems to play out the other way around, that is, instead, employment generates growth. Notably, job elasticities also do not account for technological change. Technology can indeed improve factor effectiveness in such way that the same amount of a given factor (labor, in our case) corresponds to a greater (or lesser) amount of output (Islam and Nazara, 2000). Moreover, employment elasticity is likely to miss the indirect effects of output growth. In this regard, employment multipliers that account for both static and dynamic (direct and indirect) growth effects on employment provide a more comprehensive picture of the job content of any output growth. In addition, elasticities do not say much about the quantity of jobs being actually created, meaning that both high and low levels of sectoral output growth might yield the same magnitude of elasticity.

Finally, elasticities do not take into account demography nor the quality of jobs (Kapsos, 2005; Ajakaiye et al., 2015). An inability to account for the high variability of existing jobs (with a predominance of low-quality jobs) in most African economies is a serious caveat to this indicator. Of course, it is possible to compute elasticities for some subgroups, such as women, youth, or poor employees, but there is a likely bias associated with these estimates insofar as value added accruing to these different subgroups can hardly be broken down and isolated from other components of output in available statistical databases.

Despite these limitations, the concept of employment elasticity, in comparison to alternative measures of employment intensities, namely employment/output ratio, employment/capital ratio and employment multiplier, is considered to provide the best picture of the complex relationship between growth and jobs. Different methods of computing elasticities exist, with the most straightforward one being the arithmetic method, also called arc-elasticity, which requires only two data points, the starting and end-period: $\varepsilon = \frac{\Delta E / E}{\Delta Y / Y}$, where the numerator represents the growth rate of employment, and the denominator, the growth rate of output.

There is a near consensus that this type of elasticity is much less robust than point-elasticities due in particular to its sensitivity to the choice of the starting and end periods (Islam and Nazara, 2000; Akinkugbe, 2015). Estimating point elasticities using regression analysis is another common way of analyzing the employment content of growth. The basic model sets employment as a univariate function of value added. It usually takes a log-linear form where the coefficient of the value-added variable is interpreted as the magnitude of the elasticity. We use a cross-country regression first introduced by Kapsos (2005):

$$lnE_i = \alpha + \beta_1 lnY_i + \beta_2 (lnY_i \times D_i) + \beta_3 D_i + u_i \quad (1)$$

where *E* is sectoral employment, *Y* is sectoral value added, and *D* is a country dummy variable. The value of sectoral elasticity in this setting is equal to: $\beta_1 + \beta_2$ (Kapsos, 2004; 2005).

This approach is often criticized on the grounds that it does not control for variables that can affect employment other than value added, and their omission could seriously bias the value of coefficients resulting from the regressions (Kapsos, 2005). Mkhize (2016) finds that the following factors exert a great influence on the employment/output relationship: changes in the rate of technical progress; changes in institutional settings within the labor market; and changes to wage policies. Despite these drawbacks, we estimate point elasticities using the model presented in equation (1), as they are more robust than arc-elasticities where volatile value-added growth can lead to instability in the value of elasticity from one year to another (Bartelemy, 2018).

5. Results

Using the data described in section 3 and econometric model (1) outlined in section 4, we estimate elasticities for the overall economy, industries without smokestacks, and traditional manufacturing. Due to data availability, the set of countries used to calculate elasticities differs across industries without smokestacks. Table 2 in appendix A lists countries used for all sectors except agro-industry, and those for agro-industry are listed in Table 3. In general, an elasticity of *x* indicates that a 1 percent growth in output would lead to an *x* percent growth in employment and a *1-x* percent growth in productivity. Results from the cross-country regression model are presented below.[3]

Aggregated at the country level, industries without smokestacks in Africa have an estimated average employment elasticity of 0.9 (Table 2). This elasticity is higher than the average elasticity for both the overall economy and manufacturing, highlighting the sector's potential to create jobs. Industries without smokestacks sectors are also more labor intensive in Africa compared to other regions.

Table 2: Employment-output elasticity for industries without smokestacks

	Industries without smokestacks	Manufacturing	Overall economy
Africa	0.9	0.8	0.6
Asia	0.6	0.4	0.4
Latin America	0.8	0.7	0.9

Note: Data are for 20 African, 10 Asian, and nine Latin American countries.

Having established the job creation potential of industries without smokestacks, elasticity estimates for individual sectors are shown below. Both T-T and tourism have an average elasticity of 0.7, higher than the overall economy but lower than manufacturing (Table 3). However, when Ethiopia, Zambia, and Senegal are dropped due to inconsistent or missing data, manufacturing elasticity drops to 0.7—the same as T-T and tourism. Elasticity for agro-industry is 0.4, lower than other industries without smokestacks sectors and the overall economy.

Table 3: Employment-output elasticity by region

	Manufacturing	Transport and telecom	Tourism	Agro-industry	Overall economy
Africa	0.8	0.7	0.7	0.4	0.6
Africa ex. ETH, SEN, ZMB	0.7	0.7	0.7	N/A	0.6
Asia	0.4	0.5	0.7	0.7	0.4
Latin America	0.7	0.8	0.8	0.6	0.9

Note: Manufacturing and T-T sector data are from mid-1960s to mid-2010s for most countries. Tourism data is from 1995 to 2017. The agro-industry average for Africa is based on data for 22 countries.

[3] Country-level estimates are presented in Table 1 of Appendix A.

There are two possible explanations that can reconcile the differences in our findings for agro-industry. First, as discussed earlier, data are collected from national statistical agencies in Africa, which use different methodologies and often only cover formal firms. A significant share of activity occurs in the informal sector in Africa, and informal firms are usually capital constrained and more labor intensive than their formal counterparts. Their exclusion would likely bias our elasticity estimates downwards. Second, the employment benefits of agro-industry could be dispersed along the value chain from agriculture to the post-manufacturing services activities. To fully understand the potential of agro-industry, we would need employment data that captures opportunities along the value chain.

Looking at Asia and Latin America, the T-T and tourism elasticities are higher than manufacturing in both regions while those elasticities are higher than the overall economy average only in Asia. This finding reinforces the argument that industries without smokestacks are labor-intensive and have the potential to create a large number of jobs. Asia's low manufacturing elasticity is likely due to rapid productivity growth in Asian manufacturing, highlighting the inherent tradeoff between jobs and productivity in the elasticity measure.

The similar elasticities for all aggregated industries without smokestacks in Africa highlight the potential for them to play a role in Africa's structural transformation much as manufacturing did for Asia. As industries without smokestacks are tradable, improving competitiveness in these sectors could open new international markets and create jobs in the process. As shown earlier, industries without smokestacks have higher productivity than the economy-wide average and would contribute positively to the ongoing structural transformation in Africa.

6. Conclusion

The ongoing structural transformation process in Africa is not following the same pattern as the manufacturing-led growth that occurred in today's advanced economies or more recently in East Asia. In Africa, since the 1970s, employment has moved from agriculture to low-productivity services while the share of manufacturing in GDP has stagnated around 10 percent. The share of employment in manufacturing is even lower, and job creation in the formal sector remains weak.

Given this backdrop, industries without smokestacks sectors present opportunities for African countries to generate jobs and contribute positively to the ongoing structural transformation process. These sectors present many of the same characteristics as manufacturing, including being tradable, having higher-than-average productivity, and presenting evidence of economies of scale. As seen in section 3, both tourism and T-T in particular have grown rapidly in many African countries and have relatively high productivity levels. Currently, though, both sectors employ less than 5 percent of the labor force on average. Although the share of employment remains small, it has been growing in both sectors since the 1990s.

Elasticity results from section 5 show the potential of industries without smokestacks to create jobs in Africa. Aggregated, industries without smokestacks sectors have an average elasticity of 0.9 in Africa, higher than the overall economy and manufacturing. Both T-T and tourism also have employment elasticities similar to manufacturing and near the ideal 0.7 identified in the literature, suggesting that growth in the sector could enhance productivity and generate employment. Notably, the elasticity for agro-industry of 0.4 is lower than other industries without smokestacks sectors. One potential explanation for this finding is low data quality, as data is collected by national statistical agencies using different methods. A second reason could be that employment benefits of agro-industry are dispersed across the value chain and thus not captured in our data, which only looks at the manufacturing component of agro-industry.

Our analysis is limited by the availability of cross-country comparable data for some industries without smokestacks and limited granularity of data for others. Data for both agro-industry and horticulture is limited, making a thorough time-series analysis of those sectors challenging. Further, the EASD and GGDC data sets combine transport and telecoms, two sectors that should ideally be studied separately given their different characteristics. One approach to addressing these issues would be going country by country to recreate time-series data for these sectors from national accounts and labor force surveys.

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Appendix A: Data tables

Table 1: Sector-level elasticity by country

Country	Industries without smokestacks	Manufacturing	Transport and telecom	Tourism
Burkina Faso	1.03	0.77	0.73	0.65
Botswana	0.67	0.91	0.54	0.46
Cameroon	1.51	0.65	0.86	0.88
Egypt	0.59	0.44	0.54	0.80
Ethiopia	0.98	1.24	0.69	0.65
Ghana	0.85	0.90	0.69	0.69
Kenya	1.23	1.61	1.13	0.76
Lesotho	1.21	0.57	1.04	0.93
Morocco	0.77	0.91	0.62	0.72
Mozambique	0.37	-0.02	0.06	0.55
Mauritius	0.66	0.57	0.43	0.36
Malawi	1.25	0.95	1.08	0.88
Namibia	0.87	0.61	0.57	0.95
Nigeria	0.53	0.23	0.37	0.50
Rwanda	0.67	0.47	0.56	0.79
Senegal	1.21	1.77	0.99	0.89
Tanzania	1.08	1.11	0.97	0.53
Uganda	0.96	0.80	0.90	0.73
South Africa	0.73	0.58	0.54	0.96
Zambia	0.76	1.12	0.35	0.81
China	0.60	0.38	0.46	0.25
Hong Kong SAR China	0.06	-0.36	0.66	0.74
Indonesia	0.75	0.53	0.63	0.68
India	0.75	0.50	0.59	0.28
Japan	0.33	0.02	0.20	1.38

South Korea	0.43	0.38	0.45	0.51
Malaysia	0.69	0.57	0.56	0.70
Philippines	1.03	0.70	0.89	0.64
Singapore	0.40	0.40	0.42	0.98
Thailand	0.78	0.60	0.58	0.31
Argentina	0.57	-0.03	0.38	1.00
Bolivia	0.85	1.13	0.89	0.74
Brazil	0.70	0.71	0.59	0.66
Chile	0.59	0.33	0.49	0.67
Colombia	0.85	0.77	0.85	0.77
Costa Rica	0.85	0.78	0.65	0.97
Mexico	1.02	0.89	0.88	0.55
Peru	1.12	0.77	1.35	0.63
Venezuela	0.93	0.84	1.15	0.88

Table 2: Elasticity sample (all sectors except agro-industry)

Africa		Asia	Latin America
Burkina Faso	Mauritius	China	Argentina
Botswana	Malawi	Hong Kong SAR China	Bolivia
Cameroon	Namibia	Indonesia	Brazil
Egypt	Nigeria	India	Chile
Ethiopia	Rwanda	Japan	Colombia
Ghana	Senegal	South Korea	Costa Rica
Kenya	South Africa	Malaysia	Mexico
Lesotho	Tanzania	Philippines	Peru
Morocco	Uganda	Singapore	Venezuela
Mozambique	Zambia	Thailand	

Table 3: Elasticity sample (agro-industry)

Africa		Asia	Latin America
Algeria	Kenya	China	Argentina
Botswana	Madagascar	Hong Kong SAR China	Bolivia
Burkina Faso	Malawi	Indonesia	Brazil
Burundi	Mauritius	India	Chile
Cameroon	Morocco	Japan	Colombia
Republic of Congo	Nigeria	South Korea	Costa Rica
Côte d'Ivoire	Senegal	Malaysia	Mexico
Egypt	South Africa	Philippines	Peru
Eritrea	Swaziland	Singapore	Venezuela
Ethiopia	Tunisia	Thailand	
Ghana	Tanzania		

Appendix B: Data sources

Data on the informal sector is a significant challenge in Africa. The reliance on household surveys to fill this gap only partially corrects these limitations, given that surveys are implemented with discretionary methodological choices in individual countries. These methodological choices make comparability across countries rather challenging, beyond the many other issues surrounding such surveys with respects to statistics on jobs. Both GGDC (Groningen Growth and Development Center) and national accounts data rely on survey statistics to generate information on the informal sector (Timmer, de Vries, and de Vries, 2015; McMillan and Rodrik, 2011). Benjamin and Mbaye (2012) question whether household surveys provide good estimates of informal value added and employment. They show that such surveys underestimate informal activities by restricting, in their criteria used to measure informality, informal firms to small unregistered enterprises, while many informal firms are not small. They further showcase large informal businesses that are informal by many standards and are not fully captured in national accounts data.

A wide range of data sources have been used to study the impact of growth on employment creation. Kapsos (2005) mainly uses U.N. population benchmarks (U.N., 2002), as well many sources of ILO-generated data, such as the ILO's Global Employment Trends (GET) database (ILO, 2005b), the ILO Key Indicators of the Labour Market (KILM) database (ILO, 2003a), the ILO LABPROJ database (ILO, 2003b). Fox et al. (2013) raise the following issues regarding ILO data: Many countries fail to publish data on the structure of employment for many years. When they are available, data being collected were irregular, or unavailable to the public, or not comparable across countries, due to methodological problem. Similarly, Timmer, de Vries, and de Vries (2015) have expressed concern about the WDI employment data, particularly for the agricultural sector, on the grounds that the data shows erratic and unjustified patterns over time. Finally, McMillan and Rodrik (2011) find the GGDC data set, while being useful, has limited coverage.

For elasticity estimates, a sample of 20 African countries is used for all sectors except agro-industry. Thus, our sample includes the 18 sub-Saharan African countries included in the EASD and two North African countries from the GGDC 10-sector database. Additionally, for comparison, elasticities are computed for 10 Asian and nine Latin American countries included in the GGDC 10-sector database. For agro-industry, data exists for 22 African countries and the same Asian and Latin American comparator countries as those used for other sectors.

Some important issues affecting regression results emerged upon closer look at the data sources and during the construction of the employment series for the various sources. The main issue is that employment data for many countries is linearly interpolated or estimated, which leads to results that may be biased. More information on data construction for those sectors is provided below.

Tourism

The data set uses the regression below to estimate relative productivity levels for tourism compared to the whole economy for a set of countries where detailed tourism sector data exists (mostly advanced economies). It then estimates the productivity level for African countries by plugging in GDP per capita data. This relative productivity estimate, along with the tourism sector value-added estimate, is used to calculate the number of jobs in the sector. Further, tourism value added is also estimated for most African countries.

$$Rprod = 2.0013 - 0.1e^{-0.14}.gdppc^3 - 0.3e^{-9}.gdppc^2 - 0.2e^{-4}gdppc \quad (1)$$

where *Rprod* = productivity in tourism relative to the whole economy; and *gdppc* = GDP per capita.

Transport and telecom

The GGDC and EASD data sets interpolate employment data for several countries between labor force surveys (usually conducted once every 10 years). The interpolation formula shown below leads to constant ratio for value added growth/employment growth between benchmark years, leading to employment growth trends mirroring value added growth trend minus average productivity growth.

To get around these challenges, we found three options available to us: a) for some countries/sectors, we can focus on labor force survey year endpoint arithmetic elasticities; b) we can focus only on countries where data is collected more regularly, with the disadvantage of limiting us to a smaller sample of countries; or c) dropping the countries that posed more challenges in this regard (Senegal, Zambia, Ethiopia). In our findings, we present results including and excluding Senegal, Zambia, and Ethiopia.

$$EMT^t = \frac{\frac{VA\_Q^t}{LP^{t-1}}}{EXP\left[LN\left(\frac{LP^{b2}}{LP^{b1}}\right)/(b2-b1)\right]} \quad (2)$$

where $b1 < t < b2$; $LP^t = \frac{VA\_Q^t}{EMP^t}$.