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Sectoral shifts and labour market outcomes in sub-Saharan Africa

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Abstract: Using the Economic Transformation Database, this paper attempts to assess the magnitude of structural transformation and the effects of sectoral shifts due to structural transformation on the labour market performance of 18 sub-Saharan African countries over the period from 1990 to 2018. The first part of this study examines some patterns of structural transformation in Africa, focusing on sectoral output shares, sectoral employment shares, and the relative labour productivity of sectors. We find that Africa is gradually advancing towards structural transformation but at a very slow speed. The empirical analysis indicates that the sectoral shift has a significantly negative impact on the labour market, whereas gross domestic product growth and population density reduce unemployment and non-employment.

Key words: structural transformation, employment, labour market, Africa, Economic Transformation Database

JEL classification: L16, O14, N17, N67

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1 Introduction

The pace and pattern by which workers move from the subsistence agriculture to non-agricultural sectors are at the core of economic growth and development. Successful structural transformation is associated with the movement of labour from the low-productivity agriculture sector to the high-productivity industry and service sectors. It is fundamentally made up of the following interconnected processes (Timmer and Akkus 2008):

- a decrease in the agricultural shares of both output and employment;
- the moderate movement of excess labour from rural agricultural areas to urban areas (labour migration);
- growth and modernization of the service and industrial sectors; and
- demographic change from high birth and death rates to low birth and death rates.

As a developing region Africa has much to gain from structural transformation. However, regardless of its solid improvement in terms of economic growth and development in recent decades, the continent has not fully realized its potential for structural change. In fact structural change in Africa between 1990 and 1999 was growth-reducing (Newfarmer et al. 2018), causing a fall in per capita output growth (de Vries et al. 2015; McMillan et al. 2014).

Employment in Africa is mostly informal (United Nations Economic Commission for Africa 2018). The labour markets are known for their dualistic nature with low formal employment rates. Sectors such as the urban informal sector and the agriculture sector are extensively characterized by underemployment, and the share of informal employment in total employment is about 80 per cent (Bass et al. 2017). The informal sector mainly comprises self-employment and is usually associated with low income and savings, low labour productivity, and extensive poverty.

This paper attempts to qualify the magnitude of structural transformation and measures the effects of sectoral shifts due to structural transformation on the labour market performance in some sub-Saharan African countries. In the short run, structural transformation is likely to reduce the number of employed people given the limited availability of skilled workers and time-to-build issues. In turn this can lead to greater inequality, an issue known as 'the developer's dilemma' (Alisjahbana et al. 2022) which dates back to the seminal contributions by Kutznets and Lewis. This creates room for public policy to design and implement interventions aimed at overcoming the possible negative effects of industrialization.

The paper is structured as follows. Section 2 reviews the literature on structural change in Africa. Section 3 introduces the data and provides some stylized facts, while section 4 introduces the variables and the econometric method. Section 5 presents the results, and section 6 concludes.

2 Literature review

The dominant issue in the structural transformation literature[1] is whether Africa is following previous industrialization pathways. Rodrik (2016a) argues that significant deindustrialization has taken place in recent decades both in developed economies and in Africa and Latin America (and to a lesser extent in Asia). This 'premature deindustrialization' lowers employment and value-added shares in manufacturing in Africa and Latin America at much lower levels of income than in the early industrializers. Globalization and labour-saving technical change are credited with being the causes of this phenomenon. However, Kruse et al. (2023) and Haraguchi et al. (2017) argue that there is no evidence to support the view that manufacturing's role in economic development has lessened in recent decades. This scepticism has led to a search for substitutes. Gollin (2018) argues that the modern services sector has some of the features associated with manufacturing, such as knowledge and technology spillovers and agglomeration economies. Baldwin and Forslid (2019) maintain that many service sectors are becoming more tradable, making a service-led economic transformation path feasible for many developing countries. Newfarmer et al. (2018) argue that 'industries without smokestacks'—agro-processing and horticulture, tourism, business, and trading services—can provide a large number of high-productivity jobs.

In many African countries early development policies were designed to achieve a type of transformation which entailed the adoption of management practices and new technologies that improve production efficiency (Lewis 1954). As these policies aimed to raise overall productivity through extensive government aid to the agriculture sector, many of these countries did not attain this form of structural transformation. Many African countries tend to experience by far the smallest growth in labour productivity (Benin 2016). Furthermore, studies show that a high level of gross domestic product (GDP) growth in an economy does not necessarily go hand in hand with structural transformation resulting in change in a more productive agriculture sector and a high employment rate in the manufacturing and industrial sector (McMillan et al. 2014). Instead, migrating workers from agriculture are employed in the informal urban sector and the low-productivity service sector. Some of these African countries are dependent on limited and highly productive resource sectors such as iron, oil, and ore, etc. with low employment capacity. In these African countries structural change is mainly characterized by four pathways: i) a high dependence on the resource sector, which is mostly associated with a low employment rate and is highly capital intensive; ii) the presence of small and medium-sized manufacturing firms; iii) an enterprise sector that is mostly operated and owned by households; and iv) a high presence of informal jobs in the service sector.

Whenever there are perfectly mobile and substitutable workers in the labour market, changes to the sectoral make-up of the demand for labour which does not change the aggregate labour demand have no impact on the rate of unemployment. Thus, in a period of structural transformation, the employment losses in the low-productivity and contracting sectors match the employment provided by the high-productivity and expanding sectors. But if there are frictions in the economy, a sectoral shift can cause an increase in the rate of unemployment both in the short run and long run. This was the foundation of Lilien's (1982) assumption about the relationship between the rate of unemployment and the dispersion of the growth rates of employment across sectors. An economic shock that entails a proportionate allocation of more labour to some sectors and less to others, and that does not affect aggregate labour demand, only raises the dispersion in the desired growth rate of employment, but the mean desired employment growth rate of sectors

[1] For a recent overview see Sen (2023).

of the economy remains unchanged. The changes in the employment growth rate in a given sector are always the same as the changes in the actual employment growth rate in the industry in the absence of friction. In turn workers from industries that face negative shocks may be unemployed for some time while looking for jobs in expanding industries. Increased changes to the dispersion of the desired employment rate across industries increases the number of workers moving to new and expanding industries, thereby raising the unemployment rate.

Africa, unlike East Asia where the sectoral shift is moving rapidly towards high-tech services and manufacturing, has been experiencing strong sectoral movement towards the informal services sector, which is characterized by low-paid jobs. There has been a rapid increase in non-tradable services compared to manufacturing and tradable services. Sub-Saharan Africa has a wide dispersion of labour productivity within the service sectors, including a highly productive financial sector and several low-productivity personal services and household enterprises in the trading sectors (Fox et al. 2017). The sectoral composition of these economies may have a significant impact on labour market outcomes. During structural transformation, sectors consistently engage in job creation and job destruction (De Loecker and Konings 2006). This process is further affected by the structure of the industries in question and can significantly impact the labour market stability and workers' protection in these sectors.

While sectoral shift patterns are widely considered to be essential elements in accounting for disparities in labour market performance in many parts of the world, few studies have examined this assertion for Africa. This paper aims to fill this gap by conducting a detailed analysis of the effects of sectoral shifts on the main indicators of labour market performance: the rate of unemployment growth and the employment growth rate. A sectoral shift may negatively impact labour market outcomes following a long-term change in the labour demand patterns across sectors of the economy. This can create reallocation shocks which may lead to increased unemployment as it takes time for workers from declining sectors to be absorbed by expanding sectors (Lilien 1982).

Resource-rich economies face unique challenges in their structural change. Indeed 'Dutch disease' is a story of deindustrialization after the discovery of oil (van der Ploeg 2011). A boom in global commodity prices may lead to an increase in employment in primary commodity sectors, further entrenching the high-rent, natural resource-intensive activities and therefore making the establishment of a manufacturing sector less likely.

3 Data and some facts

This study uses data from the Economic Transformation Database (hereafter ETD) produced by the Groningen Growth and Development Centre and the United Nations University World Institute for Development Economic Research (UNU-WIDER) (Kruse et al. 2023), World Development Indicators (WDIs) (World Bank 1990–2018) and Worldwide Governance Indicators (World Bank 1990–2018). The ETD provides comprehensive, long-term, and internationally comparable sectoral data on output and employment for 51 countries in Africa, Asia, and Latin America. It is the latest incarnation of previous databases that tried to provide long-term series on sectoral developments (such as the Africa Sector Database). The data ranges from the year 1990 to 2018, and we restrict our analysis to 18 sub-Saharan African countries. The same countries were used in the paper by McMillan and Rodrik (2011). Their paper covered the period from 1990 to 2005, which meant that they missed significant developments in Africa's structural transformation process.

This paper's first contribution relates to data constructed from an in-depth analysis of available statistical sources on longer time series across African countries. Although the database covers a limited number of countries, it includes rich and relatively poor countries in Africa. In addition this database has the great advantage of covering the production measures, namely value-added and employment shares at the sectoral level, and the informal sectors which are peculiar to Africa. By using census data the ETD database provides consistent employment data that can be compared to value-added data in national account calculations. Another advantage of the ETD data is that it captures the activities in the informal sector. However, the sectoral employment shares are acquired from labour force surveys because census data is not collected on a regular basis. The dependent variable used to measure labour market outcomes is the unemployment growth rate sourced from the WDI databank.

Following the International Standard Industrial Classification, the ETD database groups economic activities into ten sectors. Table 1 reports these sectors, their descriptions, and the countries covered by the dataset.

Table 1: Sectors and countries

Economic activities	ETD sector name	Description
	Agriculture	Agriculture, forestry, and fishing
	Mining	Mining and quarrying
	Manufacturing	Manufacturing
	Utilities	Electricity, gas, steam and air conditioning supply; water supply; sewerage, waste management and remediation activities
	Construction	Construction
	Trade services	Wholesale and retail trade; repair of motor vehicles and motorcycles; accommodation and food service activities
	Transport	Transport, storage, and communication services
	Business services	Information and communication; professional, scientific and technical activities; administrative and support service activities
	Financial services	Financial and insurance activities
	Real estate	Real estate activities
	Government services	Public administration and defence, education, health, and social work
	Other services	Arts, entertainment and recreation; other service activities; activities of households as employers; undifferentiated goods–and services–producing activities of households for own use; activities of extraterritorial organizations and bodies
Countries	Botswana, Burkina Faso, Cameroon, Ethiopia, Ghana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Nigeria, Rwanda, Senegal, South Africa, Tanzania, Uganda, and Zambia.	

Source: authors' compilation based on data from ETD.

A major feature of structural transformation and sectoral shift in Africa is the transition that occurs between the formal sector and the informal sector. Eight out of ten workers are employed informally in Africa, representing the highest share of employment (ILO 2018). Considering the severe work deficits connected with the informal sector and the negative effect on sustainable and inclusive economic growth, the move to formality has seized an important space in the policy agenda of the region. Hence, to see a clear pattern of this transition, we construct the series of value-added and employment by sectors and formality levels. This will allow us to show the dynamics in the formal/informal sector by analysing the three main sectors and their subsectors based on the differences in and level of formality of economic activities, particularly in the case of Africa where the informal sector is huge. The variable descriptive statistics used are reported in Table 2. Table A1 in the Appendix shows the correlation coefficient matrix of all the variables, showing a fairly strong relationship between sectoral shift and the other independent variables.

Table 2: Descriptive statistics

Variables	Obs.	Mean	SD	Min	Max
Log of unemployment	405	1.845	0.639	0.751	3.170
Log of non-employment	405	1.786	1.195	1.100	4.605
Log of sectoral shift	405	3.083	0.907	0.593	6.049
Log of GDP per capita	405	0.892	1.014	-6.031	2.830
KSI (Krugman Specialisation Index)	405	0.617	0.082	0.001	0.315
Log of population density	405	4.086	1.232	0.862	6.435
Supply–demand mismatch	405	4.186	0.192	3.732	4.514
Political instability	311	-0.880	1.112	-5.247	2.802

Source: authors' calculations based on ETD, World Development Indicators, and Worldwide Governance Indicators.

Studies on structural transformation in the 1960s describe the shape of sectoral shifts in output and employment as canonical, i.e. at the initial stages of transformation, output and labour move from agriculture to industry and then to services (Kaldor 1967). However, in recent decades, the total shares of industry in employment and value-added fell in many low-income countries (Rodrik 2016b). In most countries this phenomenon largely reflects the faster growth of services relative to manufacturing.

Table 3 reports the aggregate shares of sectors in total output in Africa using the ETD from 1990 to 2018. It shows that Africa's total output growth is highly dependent on the service sector. The contribution of the service sector slightly decreased in the past three decades, but it still led by contributing 74.52 per cent of the total output in these countries in 2018. Subsectors like trade (wholesale and retail trade; repair of motor vehicles and motorcycles; accommodation and food service activities) and government services contributed the highest percentage in the service sector. These subsectors, especially trade, are likely to attract higher levels of informality in the service sector (Ellis et al. 2018).

Table 3: Sectoral output shares

	Sectoral output share (%)						
Sectors	1990	1995	2000	2005	2010	2015	2018
Agriculture	**11.20**	**14.41**	**13.70**	**14.55**	**16.25**	**16.50**	**16.73**
Industry	**6.00**	**5.96**	**5.74**	**6.20**	**6.90**	**8.30**	**8.84**
Mining	0.16	0.17	0.16	0.15	0.17	0.18	0.18
Manufacturing	0.01	0.02	0.01	0.01	0.01	0.01	0.02
Utilities	2.54	2.37	2.12	1.96	2.05	2.43	2.51
Construction	3.29	3.41	3.46	4.09	4.69	5.70	6.78

Services	**82.80**	**79.63**	**80.57**	**79.25**	**76.84**	**75.15**	**74.52**
Trade	45.18	38.80	34.75	32.95	30.63	29..52	28.48
Transport	4.64	5.54	6.00	5.92	5.40	6.03	5.98
Business	5.78	6.16	7.28	8.64	9.77	8.94	8.59
Finance	4.40	5.11	5.58	6.05	6.45	6.49	6.47
Real estate	6.05	6.54	7.45	7.72	7.04	6.57	6.75
Government	13.39	13.60	14.85	13.55	13.63	13.56	13.72
Other services	3.35	3.88	4.70	4.42	3.91	4.02	4.42

Note: this table shows the unweighted average of the percentage of sectoral contribution to total output in Africa. It includes the 18 African countries in the ETD.

Source: authors' calculations based on ETD.

Agriculture was the second highest sector, contributing about 17 per cent to total output in 2018. The industrial sector had the smallest share of total output. The manufacturing subsector, in particular, had consistently low output and played a much smaller role in the structural change in Africa in the past three decades. These findings are consistent with the results of Coulibaly and Page (2019).

Table 4 reports the sectoral employment shares in Africa. It indicates that, over the period, economic activities in the region were mainly agrarian. Although the share of agriculture in total employment decreased from 71.07 per cent in 1990 to 51.75 per cent in 2018, the sector was still substantially greater than the second largest sector in the region. The industrial sector's share of employment across the region barely changed from 1970 to 2018. The service sector's share of total employment increased from 18.88 per cent in 1990 to 35.87 per cent in 2018, nearly offsetting the fall in the share of agriculture and making the service sector the main beneficiary of labour reallocation from the agriculture sector (see Diao et al. 2017). The same trend was true for the changing shares of total output by sectors.

Table 4: Sectoral employment shares

	Sectoral employment share (%)						
Sectors	1990	1995	2000	2005	2010	2015	2018
Agriculture	71.07	70.92	69.19	65.72	59.98	53.38	51.75
Industry	10.10	9.01	8.55	9.27	9.88	12.03	12.38
Mining	1.23	0.98	0.71	0.61	0.59	0.86	0.74
Manufacturing	7.03	6.03	5.85	6.33	6.56	7.74	8.19
Utilities	0.35	0.38	0.26	0.29	0.28	0.35	0.34
Construction	1.49	1.63	1.73	2.05	2.46	3.08	3.10
Services	18.88	20.07	22.26	25.00	30.13	34.59	35.87
Trade	9.27	9.59	10.25	12.08	13.86	14.80	14.72
Transport	1.18	1.24	1.32	1.61	2.06	2.41	2.57
Business	0.94	1.22	1.46	1.78	2.34	3.21	3.78
Finance	0.23	0.31	0.36	0.38	0.47	0.63	0.76
Real estate	0.05	0.07	0.08	0.09	0.10	0.11	0.12
Government	3.81	4.06	4.66	4.34	5.29	6.20	6.50
Other services	18.88	3.59	4.12	4.72	6.02	7.17	7.41

Note: this table shows the unweighted average of the percentage of sectoral contribution to total employment in Africa. It includes the 18 African countries in the ETD.

Source: authors' calculations based on ETD.

Table 5 reports the levels of relative labour productivity by sector in Africa. Regardless of the significant policy reforms in the agriculture sector during these periods, the levels of relative

productivity in the sector almost remained the same over the past three decades (see also Gollin et al. 2014). Relative labour productivity in the service sector continued to fall, although within the service sector subsectors like real estate and financial services (financial and insurance activities) performed relatively well in terms of labour productivity. Other subsectors such as trade services (trade, restaurants, and hotels), government services, and personal services (community, social and personal service activities, activities of private households) had the lowest levels of relative productivity. These findings are consistent with the country-specific findings of Ellis et al. (2018). Within the industry sector, subsectors such as mining and utilities had higher levels of labour productivity, with manufacturing exhibiting the lowest levels.

Table 5: Relative labour productivity by sectors

	Sectoral employment share (%)						
Sectors	1990	1995	2000	2005	2010	2015	2018
Agriculture	0.16	0.20	0.20	0.22	0.27	0.31	0.32
Industry	0.59	0.66	0.67	0.67	0.70	0.69	0.95
Mining	0.13	0.18	0.22	0.25	0.29	0.21	0.24
Manufacturing	0.01	0.03	0.01	0.01	0.01	0.01	0.01
Utilities	7.18	6.30	8.00	6.66	7.43	6.91	7.44
Construction	2.21	2.10	2.00	2.00	1.97	1.85	2.19
Services	4.39	3.97	3.62	3.17	2.55	2.17	2.08
Trade	4.87	3.84	3.39	2.73	2.21	1.99	1.93
Transport	3.93	4.48	4.52	3.86	2.62	2.50	2.32
Business	6.12	5.05	4.98	4.85	4.18	2.79	2.28
Finance	19.25	16.48	15.37	16.02	13.86	9.61	8.47
Real estate	120.92	97.71	92.70	87.52	72.37	57.25	53.77
Government	3.51	3.35	3.18	3.12	2.58	2.19	2.11
Other services	0.99	1.08	1.14	0.94	0.65	0.56	0.60

Note: relative labour productivity is the ratio of individual sector's labour productivity to the economy's total labour productivity. It includes the 18 African countries in the ETD.

Source: authors' calculations based on ETD.

Over the period 1970–90, the widespread currency instability and oil crises in Africa led to the introduction of structural adjustment programmes in the region. Several African countries, including Botswana, Ethiopia, Nigeria, Kenya, Ghana, and Rwanda, adopted a new path for structural change through the implementation of many policy reforms between 1990 and 2000.

During this period agricultural labour moved mainly to informal activities and the service sector rather than to the industrial and manufacturing sector (de Vries et al. 2015). The period after the year 2000 experienced sustained growth and the implementation of the UN's Millennium Development Goals in Africa. While there have been advancements toward structural change in these countries, the speed has been very slow compared to other Asian countries such as Indonesia and Malaysia.

4 Variables and model

In this section we introduce our dependent variables (Subsection 4.1), before we discuss the explanatory variables (subsection 4.2) and present our econometric method (4.3).

4.1 Dependent variables

Following Robson (2006) we use the unemployment growth rate and the rate of non-employment variables to measure labour market performance. Although the rate of unemployment (i.e. the share of the labour force that is without work but ready and looking for employment) is the traditional measure for determining labour market performance, it gives an incomplete picture of this market. According to the International Labour Office's definition of unemployment, an unemployed person is a working-age person who is without a job even for a few hours a week, who is incapable of taking a job in the next 15 days and who has actively looked for work in the last month. As this means that many jobless individuals whose situations do not meet these strict criteria may be excluded from the official data, we use the non-employment rate, which is a more comprehensive measure. This variable measures the change in the annual labour force participation rates among those in the population aged 15–64 years who are economically active. This covers all unemployed individuals in the strict sense of the term, including individuals who are not actively searching for jobs. By using the non-employment rate along with the unemployment rate, we avoid the inconsistency in the number of jobless people that would exist if we only used the unemployment rates (Erdem and Glyn 2001; O'Leary et al. 2005).

4.2 Explanatory variables

'Sectoral shift' is the main explanatory variable of interest. The Lilien index is often used as a measure of structural transformation in the composition of employment to determine the factors of structural unemployment. In order words it indirectly measures the extent to which sectoral shifts influence the demand for labour. Lilien (1982) hypothesizes that the restructuring of industrial set-ups resulting in sectoral shifts may lead to high levels of unemployment.

The cross-sectoral dispersion in employment is given as:

$$\sigma_{it} = \left[\sum_{i=1}^{n} s_{it}\left(\omega_{it} - \omega_{jt}\right)^2\right]^{1/2} \quad (1)$$

where *n* represents the number of sectors and subsectors, s_{it} measures the total share of each subsector to the overall employment share of aggregate sector *j*, ω_{it} is the employment growth rate in each subsector, and ω_{jt} measures the total employment growth rate in the aggregate sector *j*. This enables us to see the dispersion levels of sectors in the growth rate of employment over a given period. We expect high levels of sectoral shifts to increase the rate of unemployment and non-employment. Table 6 reports the results of the decomposition of the Lilien index for the three major sectors in each country.

Table 6: Lilien Index for 18 African countries, 1990–2018

Countries	Agriculture	Industry	Services
Botswana	0.175	0.341	0.373
Burkina Faso	0.970	1.009	0.623
Cameroon	0.155	0.817	0.770
Ethiopia	3.064	0.802	0.608
Ghana	0.909	0.920	0.902
Kenya	0.488	0.853	0.746
Lesotho	1.057	1.017	0.986
Malawi	0.692	0.950	0.803
Mauritius	1.003	0.569	0.978
Mozambique	0.768	0.534	0.461
Namibia	1.078	0.928	0.973

Nigeria	0.567	0.778	0.582
Rwanda	0.960	1.388	1.415
Senegal	0.501	0.743	0.620
South Africa	1.232	2.184	0.796
Tanzania	2.046	0.958	0.976
Uganda	0.722	0.737	0.801
Zambia	0.843	0.871	0.960

Source: authors' calculations based on ETD.

This index does not capture how sectors respond to aggregate demand fluctuation (Abraham and Katz 1986). In other words, as different sectors exhibit different growth trends and different levels of responsiveness to aggregate disturbances, the index only captures the reallocation of workers due to structural transformation. We account for the degree of industrial responsiveness by adding a sectoral specialization variable to our regressors. We use the Krugman Specialisation Index (KSI) (Krugman 1991) as a measure of sectoral specialization. This index measures relative specialization by considering the country to be specialized if its sectoral structure varies from a selected reference group, in our case the total sectors' value-added share in the above-mentioned countries, i.e. the sum of sectors' value-added in all the countries in our dataset except the country under consideration (country i). This reference group plays a significant role in generating the index. Hence, if a particular country specializes in similar sectors as the reference group, the KSI value tends to be lower for that country. The KSI is calculated using the value-added shares of each sector between countries at time t. The KSI formula KSI is given as:

$$KSI_j = \sum_{i=1}^{n} \left| s_{ij} - S_i \right| \tag{2}$$

where s_{ij} is the value-added share of sector j in country i and S_i is the total value-added share of the sector in the reference group. The KSI takes values between zero and two. If a country's KSI is close to zero, this indicates that the country has the same specialization model as the reference economic region, while a KSI value close to two shows that the country has a different specialization path compared to the reference group. In this case the country is considered to be specialized.

Table 7 reports the relative specialization KSI values of sectors in the different countries. They show that the countries with the most similar production structure in our reference group, as indicated by a relatively low KSI value for most of the period considered, are Cameroon, Mauritius, Namibia, and Senegal. This indicates a fall in dissimilarity, i.e. reduction in the diversity level of the sectoral structures in these countries as compared to the entire region. Ethiopia and Uganda tended to experience the highest degree of relative specialization in the 1990s but suddenly fell in later periods. In general these countries have KSI values close to zero, meaning they have low levels of sectoral specialization.

Population density is a proxy for urbanization. Highly populated areas are more likely to have more job seekers and vacancies, thus making the matching process more efficient and faster, which results in a lower level of unemployment (Elhorst 2003). However, Niebuhr (2003) and others believe that highly populated regions may suffer from the effects of congestion causing higher unemployment. Population density is calculated as the ratio between the mid-year population and the area in square kilometres. The population is constructed based on the de facto meaning of population, which includes all residents regardless of legal status or citizenship.

The *political instability* variable measures the perceptions of the likelihood of politically motivated violence and political instability in Africa. Estimates give the country's score on the aggregate indicator in units of standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.

Higher levels of political stability are expected to provide a conducive atmosphere for economic prosperity, investment, and associated externalities, which leads to a decrease in the unemployment rates. In addition, *GDP per capita growth* enters the set of independent variables as the growth of economic activities increases the demand for labour.

Finally, the *supply–demand mismatch* is included in the set of regressors. Following Basile et al. (2012), it is measured as the difference between the labour participation rate and the employment rate.

Table 7: KSI values

Countries	1990	1995	2000	2005	2010	2015	2018
Botswana	0.455	0.326	0.427	0.387	0.244	0.262	0.289
Burkina Faso	0.251	0.276	0.272	0.317	0.257	0.229	0.151
Cameroon	0.145	0.100	0.137	0.063	0.042	0.054	0.018
Ethiopia	1.027	0.823	0.696	0.637	0.610	0.464	0.360
Ghana	0.239	0.228	0.212	0.218	0.174	0.172	0.054
Kenya	0.325	0.268	0.303	0.189	0.243	0.333	0.401
Lesotho	0.216	0.304	0.187	0.197	0.188	0.199	0.213
Malawi	0.297	0.475	0.605	0.483	0.365	0.336	0.272
Mauritius	0.020	0.080	0.134	0.216	0.249	0.309	0.407
Mozambique	0.592	0.357	0.201	0.241	0.295	0.207	0.239
Namibia	0.066	0.193	0.085	0.064	0.115	0.184	0.179
Nigeria	0.286	0.364	0.272	0.259	0.178	0.106	0.096
Rwanda	0.532	0.521	0.439	0.496	0.295	0.292	0.291
Senegal	0.121	0.076	0.099	0.047	0.034	0.034	0.005
South Africa	0.143	0.212	0.195	0.219	0.247	0.270	0.287
Tanzania	0.287	0.297	0.294	0.257	0.255	0.304	0.325
Uganda	0.715	0.531	0.368	0.296	0.372	0.205	0.146
Zambia	0.202	0.096	0.112	0.037	0.153	0.213	0.278

Sorce: authors' calculations based on ETD.

4.3 Econometric model

We first estimate the labour market outcomes through fixed-effect panel estimations in order to take account of country-specific non-varying unobservables. However, we expect these estimates to suffer from the endogeneity problems that are usually caused by omitted variables and simultaneous errors.

To solve this problem we employ the system generalized method of moments (GMM) estimator suggested by Arellano and Bover (1995) and Blundell and Bond (1998), which combines the standard set of moment conditions in first differences using lagged levels as instruments, with an additional set of moment conditions derived from the equation in levels. System GMM is able to eliminate dynamic panel bias and produces estimates that are consistent and efficient even if the independent variables are not strictly exogenous (Nickell 1981). This technique tackles the problem of endogeneity by using either the levels or the first difference of the lagged values of the explanatory variable. System GMM allows for a large number of instruments by assuming that the first differences of instruments are uncorrelated with the fixed effects, thus yielding more efficient estimators (Roodman 2009). The Blundell and Bond GMM estimators are mainly based on the instrumental variable technic, and the validity of these instruments is mainly tested using the Sargan–Hansen test. The generating process of the system-GMM estimator of the first-order autoregressive panel data model is specified as:

$$y_{it} = \alpha y_{i,t-1} + \beta X'_{it} + \epsilon_{it} \quad (3)$$

where $\epsilon_{it} = \mu_i + \gamma_{it}$

$$E(\mu_i) = 0, E(\gamma_{it}) = 0, E(\gamma_{it}\mu_i) = 0 \quad i = 1,2,\dots,n; t = 2,3,\dots,T \quad (4)$$

$$E(\gamma_{it}\gamma_{is}) = 0 \quad i = 1,2,\dots,n \ \ and \ t \neq s \quad (5)$$

These initial conditions give that:

$$E(y_{i1}\gamma_{it}) = 0 \ for \ t \geq 2 \quad (6)$$

$$E(\mu_i \Delta y_{i2}) = 0 \quad (7)$$

Linear moment conditions are given as follows under the above assumptions:

$$E\left(y_{i,t-s}\Delta\epsilon_{it}\right) = 0 \ \ for \ t \geq 3 \ and \ s \geq 2 \quad (8)$$

$$E\left(\epsilon_{it}\Delta y_{i,t-1}\right) = 0 \ for \ t \geq 3 \quad (9)$$

For the system-GMM estimators to be consistent, they must meet two key conditions. Firstly, the error terms should not be serially correlated. The Arellano–Bond test for serial correlations examines the first- and second-order auto-correlated error terms in the first differenced equation. To control for first-order autocorrelation in levels, they analyse the second-order autocorrelation in differences and this will ascertain the correlation between γ_{it-1} in $\Delta\gamma_{it-1}$ and γ_{it-2} in $\Delta\gamma_{it-2}$ (Roodman 2009). Secondly, the instrumental variables generated in the model should not be correlated with the disturbance term. The Hansen test detects the correct specification of the instruments generated and reports the p-values for the null hypothesis of instrument validity.

The regression equations are specified below:

$$Log(Unemployment_{it}) = \beta_0 + \beta_1 Log(sectoral\ shift_{it}) + \beta_2 Log(GDP\ per\ capita_{it}) + \beta_3 Log(Population\ density_{it}) + \beta_4 Log(Supply - Demand\ mismatch_{it}) + \beta_5(KSI_{it}) + \beta_6(Political\ instability_{it}) + \mu_i + \sigma_t + \gamma_{it} \quad (10)$$

$$Log(Nonemployment_{it}) = \beta_0 + \beta_1 Log(sectoral\ shift_{it}) + \beta_2 Log(GDP\ per\ capita_{it}) + \beta_3 Log(Population\ density_{it}) + \beta_4 Log(Supply - Demand\ mismatch_{it}) + \beta_5(KSI_{it}) + \beta_6(Political\ instability_{it}) + \mu_i + \sigma_t + \gamma_{it} \quad (11)$$

where *t* and *i* denote time and country respectively, β_0 is the constant, and β_1 to β_6 represent the coefficient of the explanatory variables.

5 Results

Tables 8 and 9 report the fixed-effect results and Tables 10 and 11 report the GMM results for unemployment and non-employment respectively. The two techniques give qualitatively similar results. However, given possible endogeneity between labour market variables and sectoral shifts, we consider the system-GMM estimations as our benchmark results (which address the problem of endogeneity by using the lagged values of the independent variables as instruments).

In Table 8, sectoral shift has a pattern of positive impacts on unemployment, except for column (1). The results also show that countries with higher GDP per capita growth rates tend to experience significantly lower unemployment rates. In addition the KSI shows negative significant effects on unemployment rates in all the model specifications. The log of population density and the log of supply–demand mismatch also tend to have negative effects on employment rates, with particularly high significance for the latter. Finally, political instability has a positive and significant impact on unemployment. Due to a lack of observations available for this variable, the overall dataset is reduced by more than 20 per cent in this last estimation.

Table 8: Fixed-effect results (unemployment)

Variables	(1)	(2)	(3)	(4)	(5)
Log of sectoral shift	0.040	0.051*	0.054*	0.052**	0.073**
	(0.016)	(0.016)	(0.045)	(0.015)	(0.029)
Log of GDP per capita	-0.109*	-0.109*	-0.092**	-0.064**	-0.059**
	(0.069)	(0.069)	(0.069)	(0.057)	(0.054)
KSI		-0.937*	-0.498*	-1.066**	-1.152**
		(0.948)	(0.539)	(0.731)	(0.772)
Log of population density			-0.043**	-0.054**	-0.079**
			(0.026)	(0.024)	(0.024)
Log of supply–demand mismatch				-0.128***	-0.194***
				(0.172)	(0.023)
Political instability					0.472***
					(0.337)
Observations	405	405	405	405	311
R^2	0.005	0.007	0.017	0.113	0.456

Note: robust standard errors are in parentheses. *p < 0.1, **p < 0.05, ***p < 0.01.

Source: authors' calculations based on ETD, World Development Indicators, and Worldwide Governance Indicators.

Table 9 shows the fixed-effect results on our second labour market measure: non-employment. It shows that countries experiencing higher levels of sectoral shift are more likely to face an increase in the non-employment rate. Explanatory variables such as the log of GDP per capita, the log of population density, and political instability have a similar impact on both measures of labour market outcomes. The KSI has no significant impact on non-employment in all the specifications. The log of supply–demand mismatch significantly affects non-employment although the sign is not as expected.

Table 9: Fixed-effect results (non-employment)

Variables	(1)	(2)	(3)	(4)	(5)
Log of sectoral shift	0.077*	0.184*	0.210*	0.282**	0.441**
	(0.037)	(0.037)	(0.036)	(0.156)	(0.218)
Log of GDP per capita	-0.027	-0.025	-0.025*	-0.092*	-0.010*
	(0.016)	(0.016)	(0.016)	(0.166)	(0.173)
KSI		0.967	0.794	0.995	0.913
		(0.914)	(0.817)	(0.920)	(0.928)
Log of population density			-0.029**	-0.055**	-0.171***
			(0.049)	(0.109)	(0.186)
Log of supply–demand mismatch				0.921**	0.970***
				(0.828)	(0.943)
Political instability					0.503***
					(0.343)
Observations	405	405	405	405	311
R^2	0.009	0.019	0.097	0.150	0.232

Note: robust standard errors are in parentheses. *p < 0.1, **p < 0.05, ***p < 0.01.

Source: authors' calculations based on ETD, World Development Indicators, and Worldwide Governance Indicators.

Moving to the system-GMM estimations, we preliminarily observe that the Hansen over-identification test indicated in both Tables 10 and 11 in all five specifications suggests that the instruments that are used in the system GMM are all valid. Also, the p-values for AR(2) are all above 10 per cent, indicating the absence of autocorrelation except in column (1) of Table 10.

Column (5) of Table 10 shows that the coefficient of the sectoral shift which is measured using the logarithm of the Lilien index has a positive significant impact on the rates of unemployment. Any alterations in the Lilien index can be linked to relatively high unemployment rates, implying that structural transformation may hamper labour market performance. Hence, sectoral shift patterns play a significant role in determining the disparities in labour market performance in Africa. The evidence shows that countries with high GDP per capita growth rates tend to experience low unemployment rates. This effect is significant at the 10 per cent level confidence interval except in specification (2). However, the variable of specialization which is measured by the KSI shows no significant effects on unemployment rates in all the model specifications. Although the sign is as expected, the result is rather surprising.

The evidence in Table 11 also indicates that population density has a negative relationship with unemployment and non-employment rates, i.e. an increase in a country's population density by 1 per cent will cause the unemployment rate to fall by 8.2 per cent, all else being equal. This finding is in line with Elhorst (2003), who suggests that large and dense urban labour markets usually exhibit a higher degree of efficiency in the matching process, which leads to a fall in unemployment. Likewise, the variable of supply–demand mismatch reduces the rates of unemployment, thus enhancing the better performance of the labour market.

Table 10: System-GMM results (unemployment)

Variables	(1)	(2)	(3)	(4)	(5)
Log of sectoral shift	0.097*	0.099*	0.095*	0.054**	0.081**
	(0.044)	(0.045)	(0.050)	(0.046)	(0.037)
Log of GDP per capita	-0.076*	-0.077*	-0.056	-0.070*	-0.067*
	(0.036)	(0.036)	(0.032)	(0.38)	(0.032)
KSI		-0.263	-0.198	-0.303	-1.388***
		(0.540)	(0.535)	(0.512)	(0.031)
Log of population density			-0.186***	-0.163***	-0.082**
			(0.011)	(0.013)	(0.010)
Log of supply–demand mismatch				-0.345***	-0.298***
				(0.217)	(0.031)
Political instability					0.467***
					(0.019)
Observations	405	405	405	405	311
Hansen–Sargan test	1.000	1.000	0.997	0.995	0.988
AR(2)	0.021	0.101	0.124	0.113	0.150

Note: robust standard errors are in parentheses. *p < 0.1, **p < 0.05, ***p < 0.01.

Source: authors' calculations based on ETD, World Development Indicators, and Worldwide Governance Indicators.

Higher initial conditions result in lower growth rates, and hence labour demand above labour supply implies a fall in unemployment rates. Furthermore, the results show that higher levels of political instability lead to higher unemployment rates. Hence, countries prone to politically motivated violence and political instability are likely to experience a 46.7 per cent increase in the rate of unemployment.

Table 11: System-GMM results (non-employment)

Variables	(1)	(2)	(3)	(4)	(5)
Log of sectoral shift	0.172**	0.178*	0.217*	0.223**	0.492**
	(0.162)	(0.176)	(0.197)	(0.189)	(0.197)
Log of GDP per capita	-0.205*	-0.206	-0.173*	-0.092	-0.016**
	(0.151)	(0.152)	(0.143)	(0.153)	(0.211)
KSI		0.062	0.042	2.552	0.799*
		(1.762)	(1.779)	(1.602)	(0.943)
Log of population density			-0.270***	-0.352***	-0.171*
			(0.058)	(0.063)	(0.078)
Log of supply–demand mismatch				2.081***	2.234**
				(0.632)	(0.345)
Political instability					0.527***
					(0.107)
Observations	405	405	405	405	311
Hansen–Sargan test	0.989	0.998	0.999	0.972	0.989
AR(2)	0.126	0.211	0.261	0.213	0.262

Note: robust standard errors are in parentheses. *p < 0.1, **p < 0.05, ***p < 0.01.

Source: authors' calculations based on ETD, World Development Indicators, and Worldwide Governance Indicators.

Table 11 reports the results of the second measure of labour market performance: non-employment rates. As shown in the analysis of the rates of unemployment, there is strong evidence that countries experiencing higher levels of sectoral shift are more likely to face an increase in the non-employment rate, all else being equal. Although the significance levels in both analyses are the same, the impact of sectoral shift is higher on non-employment rates than on unemployment, as expected. However, in the measure of sectoral specialization, the KSI has no significant effect in all the specifications except in column (5) of Table 11. This significance is weak and the sign that

the variable exhibits is unexpected. In addition the population density and political instability variables have similar levels of significance for both unemployment and non-employment but the impact they have on non-employment again is higher than on unemployment. Political instability has a positive effect on the rates of non-employment, i.e. a degree increase in the level of politically motivated violence causes unemployment and non-employment rates to rise by 47 and 53 per cent respectively. Surprisingly, the supply–demand mismatch variable is statistically significant in both models but exhibits different signs.

In summary the results from the two sets of analyses highlighted above show that structural transformation has a statistically significant impact on labour market performance in sub-Saharan African economies. The evidence indicates that sub-Saharan African countries with a higher degree of structural transformation are more susceptible to higher rates of unemployment and non-employment, 0.081 and 0.492 points respectively. These high rates, especially the non-employment rates, may be due to the high degree of informality among sectors, particularly in the leading employer sector, i.e. the service sector. We used several determinants of labour market performance to analyse the impact of sectoral shifts due to structural transformation. Of these determinants, the results are most consistent for GDP per capita growth, population density, and political stability. In most cases the effects of these variables are higher for non-employment rates than for unemployment rates, as expected.

6 Conclusions

Using the ETD (Kruse et al. 2023), this paper aimed to assess the magnitude of structural transformation and the effects of sectoral shifts due to structural transformation on the labour market performance of 18 sub-Saharan African countries from 1990 to 2018. The first part of this study examined the general pattern of structural transformation in Africa: we computed the sectoral output share, the sectoral employment share, and the relative labour productivity of sectors. From this analysis we found that Africa's total output growth is highly dependent on the service sector and that the share of manufacturing to output consistently played a very minor role in the past three decades. Although agriculture contributed to about 51 per cent of total employment in 2018, its value-added and employment shares experienced a fall in the period under analysis, indicating the changing production structure in the region. The service sector had the highest level of labour productivity, followed by industry and agriculture, which contributed the least to total labour productivity regardless of their role as the major employers in the region. From these results we can see that, although there have been advancements toward structural transformation in these countries, the speed has been very slow compared to other countries in Asia.

Finally, we presented an empirical analysis that studied the effects of sectoral shifts on labour market performance. Our preferred estimator is the system GMM because the fixed-effects model can produce biased and inconsistent estimators due to endogeneity problems, although actual results do not differ much between the methods. To determine the effects of sectoral shift on labour market outcomes, we used the measure developed by Lilien (1982). We found that countries with a higher degree of sectoral shift are likely to suffer from increasing rates of unemployment and non-employment rates. This effect may be due to the high level of informality in Africa. In addition the population density and political instability variables have similar levels of significance on both unemployment and non-employment, but the impact they have on non-employment is again higher than on unemployment.

In light of this governments should introduce policies and reforms that shift the excess labour from agriculture to the formal sector rather than to the informal service sector. In the medium term this means that workforce development and skills training are crucial components of structural transformation (African Development Bank 2020) together with innovation and regional integration (United Nations Economic Commission for Africa 2016). In the long term the promotion of democracy and the reduction of inter- and intra-state conflicts will also facilitate structural transformation and higher levels of employment.

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Appendix

Table A1: Correlation matrix

	L_unemploy-ment	L_nonemploy-ment	L_sectoral shift	L_GDP per capita	KSI	L_population density	L_supply-demand mismatch	Political instability
L_unemployment	1.00							
L_non-employment	0.32	1.00						
L_sectoral shift	0.11	0.35	1.00					
L_GDP per capita	-0.13	-0.15	0.27	1.00				
KSI	0.13	0.03	-0.19	-0.10	1.00			
L_population density	-0.28	-0.45	-0.39	0.23	-0.28	1.00		
L_supply-demand mismatch	-0.31	0.30	-0.16	-0.14	0.19	-0.23	1.00	
Political instability	0.17	0.15	-0.36	-0.10	-0.06	-0.09	-0.25	1.00

Source: authors' calculations based on ETD, World Development Indicators, and Worldwide Governance Indicators.