Africa Sector Database

Contents, sources and methods

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Contents

1. Introduction

Comparative studies of structural change and productivity growth have been hampered by the lack of a large-scale international database on output and productivity trends by sector in developing countries. In this document we present the Africa Sector Database (ASD) developed by the Groningen Growth and Development Centre (GGDC), which is the first database to provide long-term series on sectoral developments in Africa. The database is constructed on the basis of an in-depth study of available statistical sources on a country-by-country basis. We discuss the contents of the database, the selection procedure of the sources, and the methods used to ensure intertemporal, international and internal consistency. Compliance with consistency requirements is important to ensure the usefulness of the database in long-term analyses of growth and productivity.

The development of the Africa Sector Database (ASD) is part of a research project, financed by DFID/ERSC, that aims to analyse the determinants of structural change and productivity growth in Africa since independence. This project provides an empirical base for theoretical research in the area of economic growth. A comprehensive, harmonized, longitudinal dataset covering inputs and outputs was previously not available for Africa. In addition the database is meant to support the conduct of policies aimed at facilitating structural change in African countries. When using this database reference should be made to:
de Vries, G.J., M.P. Timmer, and K de Vries (2013). "Structural Transformation in Africa: Static gains, dynamic losses," GGDC research memorandum 136.

The ASD is constructed to be intertemporally, internationally and internally consistent. Through our linking procedure as described in section 4, the series have been smoothed by repairing major breaks, thereby assuring intertemporal consistency. International consistency of the cross-country sectoral data is ensured by the application of the SNA framework for the measurement of Gross Domestic Product (GDP) in the sources we use. By using a consistent employment concept of persons engaged across countries and employing a harmonized sector classification (ISIC Rev. 3.1), international consistency of these variables is ensured. For the derivation of meaningful productivity estimates, the labour input and output measures should cover the same activities, that is, they should be internally consistent. As we use persons employed as our employment concept rather than employees, our employment and value added variables match.

Section 2 describes the contents and basic set-up of the database. The ASD includes measures of economic growth and labour inputs for eleven African countries at a 10-sector level from 1960 onwards. The input measures include value added in current and constant prices and persons employed by gender. This database builds upon earlier efforts by McMillan and Rodrik (2011). The ASD also includes newly derived *sector-specific* PPPs that allow for new measures of productivity levels.

Section 3 compares the ASD with other international datasets. We argue that in particular consistent long-run estimates for employment are lacking.

Sections 4 and 5 describe the general sources and methodology followed in constructing the variables of the ASD. Value Added is discussed in section 4 and Employment in section 5. In constructing the database we collected relevant information from libraries, archives and the internet. We describe in general which sources are used, and present the hierarchy in which we apply them in the ASD. We

make systematic use of the sources to construct a harmonized, longitudinal database. Our general method to construct value added measures is to use level data from the latest revision and back cast this data using sectoral growth rates from historical statistics. Value added in constant prices is calculated from estimated series of nominal data and price deflators, and rebased to express values in 2005 prices.

Data on employment is typically not available from the National Accounts Statistics (NAS), it is therefore much scarcer than data on value added. We pay particular attention to derive series that are consistent in terms of coverage with the NAS value added and rely heavily on population censuses for the benchmark years. Establishment surveys are generally used to interpolate series in between these benchmarks.

Section 6 discusses the construction of sector specific Purchasing Power Parities (PPPs). To measure relative labour productivity levels, a key issue is how to convert real value added into common currency units. Conceptually, the appropriate rate of exchange is a purchasing power parity (PPP). In addition, by now it is well known that relative prices vary substantially across tradable and non-tradable sectors, such that the use of aggregate PPPs is not appropriate (Inklaar and Timmer, 2012). Relative prices across sectors are based on price data collected by the World Bank in the 2005 ICP round except for agriculture, which is based on unit value information from FAO.

Section 7 discusses the consistency, validity and reliability of the ASD. We describe the main limitations of sectoral value added and employment statistics. A major revision of GDP for Nigeria is still pending and therefore not yet taken into account in the current version of the ASD.

Country specific notes can be found in the appendix.

2. Contents of the ASD

Synopsis of the main points

- ASD covers data for eleven countries, six variables and ten sectors for the period 1960-2010.
- The ISIC Rev. 3.1 sector classification is used.
- Data for Dwellings is presented separately for the purpose of productivity analysis.

In this section we describe the content and basic set-up of the database. The coverage of countries and variables and the sector classification are also discussed.

Table 1 **Variable codes and descriptions**

ASD variable code	*Variable description*
VA	Value added in current prices in local currency
VA_Q05	Value added in constant 2005 prices in local currency
VA_P	Value added price deflator index (2005=100)
EMP	Persons engaged
EMP_M	Male employment
EMP_F	Female employment

In principle, the period for which data is available is 1960-2010. However, due to data limitations this differs across countries, industries and variables as indicated in Table 2.

2.1 Countries and availability of variables

Table 2 provides a list of the countries covered in this database; as well as the period for which data is available. Employment by sector includes a gender split. Value added (VA) values in current and constant prices are expressed in local currency. We also provide sectoral purchasing power parities (PPPs) for the year 2005.

Table 2 **Countries covered and starting year of data series**

Acronym	*Country*	*Currency*	*VA*	*VA_Q05*	*VA_P*	*EMP*	*EMP_M*	*EMP_F*
BWA	Botswana	Pula (P)	1964	1964	1964	1964	1964	1964
ETH	Ethiopia	Birr (Br)	1961	1961	1961	1961	1961	1961
GHA	Ghana	Cedi (¢)	1960	1960	1960	1960	1960	1960
KEN	Kenya	Shilling (KSh)	1960	1964	1964	1969	1969	1969
MWI	Malawi	Kwacha (MK)	1960	1966	1966	1966	1966	1966
MUS	Mauritius	Rupee (R)	1960	1970	1970	1970	1970	1970
NGA	Nigeria	Naira (₦)	1960	1960	1960	1960	1960	1960
SEN	Senegal	Franc (CFA)	1960	1970	1970	1970	1970	1970
ZAF	South Africa	Rand (R)	1960	1960	1960	1960	1970	1970
TZA	Tanzania	Shilling (SHS)	1960	1960	1960	1960	1960	1960
ZMB	Zambia	Kwacha (ZK)	1960	1965	1965	1965	1965	1965

2.2 Sector classification

Table 3 gives an overview of the sector classification used in the ASD. The database covers the ten main sectors of the economy using the International Standard Industrial Classification, Revision 3.1 (ISIC Rev.3.1). These ten sectors cover the total economy and are consistent with the sectors used in the GGDC 10-sector database.[1] In the remainder of this document we refer to the sectors by using their ISIC Rev.3.1 code and ASD sector name, given in the first and second column. The official ISIC descriptions are given in the final column.

Table 3 **ASD sector list**

ISIC Rev3.1 code	*ASD sector name*	*ISIC Rev3.1 description*
AtB	Agriculture	Agriculture, Hunting and Forestry, Fishing
C	Mining	Mining and Quarrying
D	Manufacturing	Manufacturing
E	Utilities	Electricity, Gas and Water supply
F	Construction	Construction
G+H	Trade services	Wholesale and Retail trade; repair of motor vehicles, motorcycles and personal and household goods, Hotels and Restaurants
I	Transport services	Transport, Storage and Communications
J+K	Business services	Financial Intermediation, Real Estate, Renting and Business Activities
70	Dwellings	*Owner occupied Dwellings (is part of Business services)*
L,M,N	Government services	Public Administration and Defence, Education, Health and Social work
O,P	Personal services	Other Community, Social and Personal service activities, Activities of Private Households
TOT	Total Economy	Total Economy

2.3 Dwellings

One special characteristic of the ASD is the treatment of dwellings. The output of the Dwellings sector (70) according to the System of National Accounts includes two subsectors: the output of the dwelling rental sector, and an imputation of owner occupied houses. This imputation is based on an equivalent rent approach and is added to GDP according to the System of National Accounts. This imputed production does not have an employment equivalent, therefore it should be excluded for the purpose of productivity comparisons.[2] Botswana and Ghana do not produce separate series for Dwellings, in these cases we use the share of Dwellings in Business services from Mauritius. In order to estimate the nominal VA series, we apply the share of dwellings in the Business services sector (J+K). Data from Mauritius is used because it has a similar country size and economic structure compared to Botswana and Ghana. Furthermore, the Mauritian level of statistical capacity is relatively developed as compared to other African countries. The estimated nominal series are deflated using the price deflator of the total Business sector (J+K).

[1] Timmer and de Vries, 2009. Data is available at: http://www.rug.nl/research/ggdc/data/10-sector-database .
[2] Typically, imputed rents are included in the output of the financial and business services sector and frequently increase output in this sector by 50 percent or more without any labour input equivalent. This percentage varies over time and across countries.

3. Comparison with international databases

Time series on VA for African countries are available from other sources as well, such as the UN National Accounts Statistics and the World Development Indicators (WDI 2013). The UN presents continuous data for seven sectors for the period 1970-2011, regardless of the availability of official data.[3] VA data in the WDI dataset is available for four sectors and generally from 1960 onwards, depending on the availability of official data.[4] VA figures are derived from official national accounts data, and consequently, the UN, WDI and ASD are highly correlated in principle.

Nonetheless, it takes an extra effort to combine and check the various official data sources to form data series which best reflect reality. This is especially the case in the context of African statistics with its reliability issues. While we do not state that our series are perfect, we do emphasize that we took an extra effort to create the best possible VA series. A few examples make this more insightful. First, we cross-checked unusual bumps in the official series with other sources. An example is the Nigerian volume data on Agriculture (AtB) for 2002, which reports an increase of 44% as compared to the previous year, while the growth rates for the years before and after this period are around 5%. Adeyinka, Salau and Vollrath (2013) argue that this unusual increase is caused by a spike in the reported crop VA. They compare the reported figures with FAO production data, which does not show an unusual increase. We corrected the Nigerian AtB figures accordingly.

Second, we meticulously searched and used all available statistics. Official VA data is lacking for Ghana for the period 1986-1992. In the UN series data gaps are filled by using either -less detailed- WDI data or average growth rates. In the case of UN data for Ghana this has led to unusual growth rates for several sectors for 1992/1993. Manufacturing (D) output shows a decline of 60% while Construction (F) output grows with 30%. However, more detailed sectoral VA data (nine sectors) is available from the African Statistical Yearbooks, which we consulted in this case.

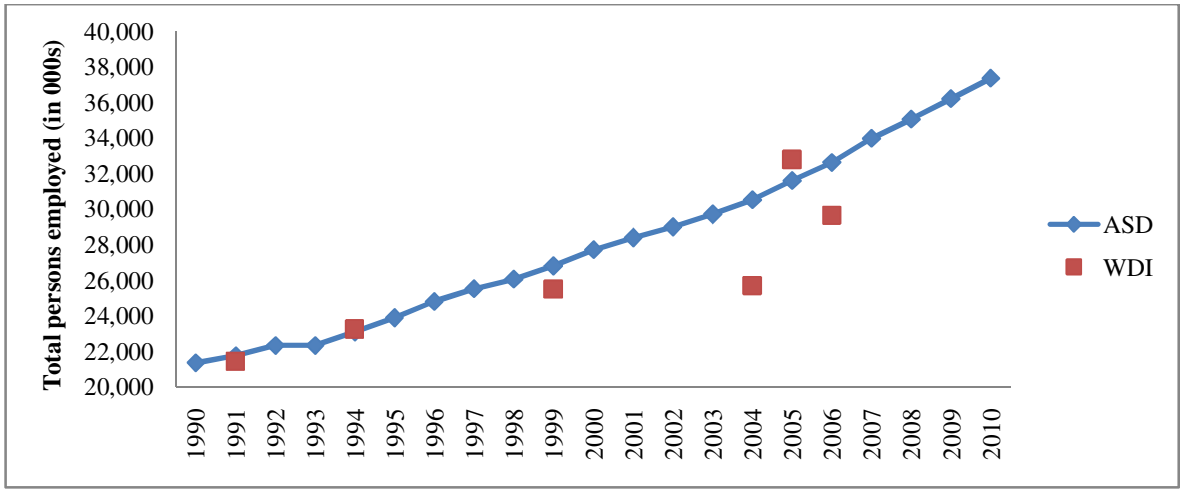
Finally, we constructed data for each country separately and used methods to maximise the use of the available country-specific sources. Conversely, the international datasets use a one-size-fits-all approach to fill data gaps. This sometimes leads to strange jumps in the series. An example for this is Botswana, for which there are some gaps in the official data for the early period. The WDI reports real industrial value added growth rates of 80% and 50% in 1969 and 1970 respectively.[5] Official data is missing for 1969 and 1970, while the 1968 values for sector Mining (C) are negative.[6] This period however saw the rise of the diamond mining industry which eventually would be a relatively large contributor to the national income of Botswana. It is for these reasons that the WDI figures show such high growth rates, which are in fact based on the wrong assumptions. In the ASD we interpolated the price deflators for the years where official data is lacking.

Employment

[3] The available sectors in the UN data are (with the ISIC Rev.3.1 industry codes in brackets): Agriculture, hunting, forestry and fishing (AtB), Mining and Utilities (C+E), Manufacturing (D), Construction (F), Wholesale, retail trade, restaurants and hotels (G+H), Transport, storage and communication (I), Other activities (J-P).
[4] The available sectors in the WDI are: Agriculture (AtB), Manufacturing (D), Mining, Utilities and Construction (C+E+F), Services (G-P).
[5] 'Industry' in the WDI refers to the sectors Mining (C), Manufacturing (D), Utilities (E) and Construction (F).
[6] These values refer to 'operating losses' and are hence not strictly comparable to the other official VA data.

The WDI also provides employment measures, including time series on labour force by gender, unemployment rates by gender and shares of total employment by three main sectors. Data on labour force by gender is available from 1990 onwards.[7] The participation rates are derived from the ILO Economically Active Population, Estimates and Projections (6th edition, October 2011) and applied to their own population estimates. Included in the labour force are the employed as well as the unemployed. For the purpose of subtracting the unemployed, unemployment rates are included, which are derived from the ILO's Key Indicators of the Labour Market (7th Edition, KILM). However, this data is only available for some years and even non-existent for Nigeria. Furthermore, it appears that the concepts and geographical coverage are not harmonized. For example, in Ethiopia the unemployment rate drops from 23% in 2004 to 5% in the following year, only to rise again to 17% in 2006. The KILM database flags the 2005 figures for only covering urban areas, but this warning is lacking in the WDI. Figure 1 plots total persons employed as calculated from the unemployment rates and labour force series from the WDI and the corresponding ASD figures. This suggests that employment data in WDI is scattered and not intertemporally consistent.

Figure 1 – *Total persons employed in Ethiopia from 1990-2010 according to WDI 2013 and the ASD.*



Note: WDI data has been calculated by subtracting the unemployed from the labour force series.
Sources: WDI from WDI 2013 series 'Labor force, total' and 'Unemployment, total (% of total labor force).' ASD from ASD total persons engaged figures.

WDI also provides shares of total employment by three main sectors, agriculture, industry and services. The availability of these shares, which are mostly taken from the KILM database, is scarce. For most countries there are only two or three observations for the period 1990-2010, while there is nothing at all for Malawi. Furthermore, as is the case with the unemployment rates, the data is not consistent. This is due to differences in concepts and methods of the data.

Particularly striking are the shares of agricultural employment for Botswana. Table 1 presents the shares of employment in agriculture for Botswana for the years for which data is available from the WDI dataset and compares them to the corresponding ASD figures. The 1985 shares are similar, but for most of the years there is a big difference between the WDI and ASD. Also noticeable are significant jumps in the WDI series, especially from 2000 to 2001 to 2003. The WDI data for Botswana suggests that different sources are used without harmonization of concepts and

[7] Interestingly, until the September 2005 edition the labour force series ran from 1960 onwards, since then the series start in 1980. However, in the latest edition (july, 2013) the series start in 1990.

methodology. The 2001 data stems from the Population and Housing Census, the 1985, 1996 and 2006 data stem from Labour Force Survey's while the remaining figures are taken from various household surveys which are mainly intended to measure the living standards of the poor. These sources all use different definitions of employment and different reference periods. Similar breaks in series of shares of agricultural employment are apparent for other countries. In Senegal it drops from 46% in 2001 to 34% in 2006, while in Zambia it rises from 50% in 1990 to 72% in 1998.

Table 1 - *Employment in agriculture in Botswana as a % of total employment according to WDI 2013 and the ASD.*

Year	1985	1996	1998	2000	2001	2003	2006
WDI 2013	58	16	21	20	12	21	30
ASD	54	39	41	38	36	37	39
Difference in percentage points (WDI-ASD)	-4	-23	-20	-18	-24	-16	-9

Note: WDI shares have been rounded to sum up to 100.
Source: WDI from WDI 2013 series 'Employment in Agriculture (% of total employment).' ASD from ASD total persons engaged in Agriculture figures.

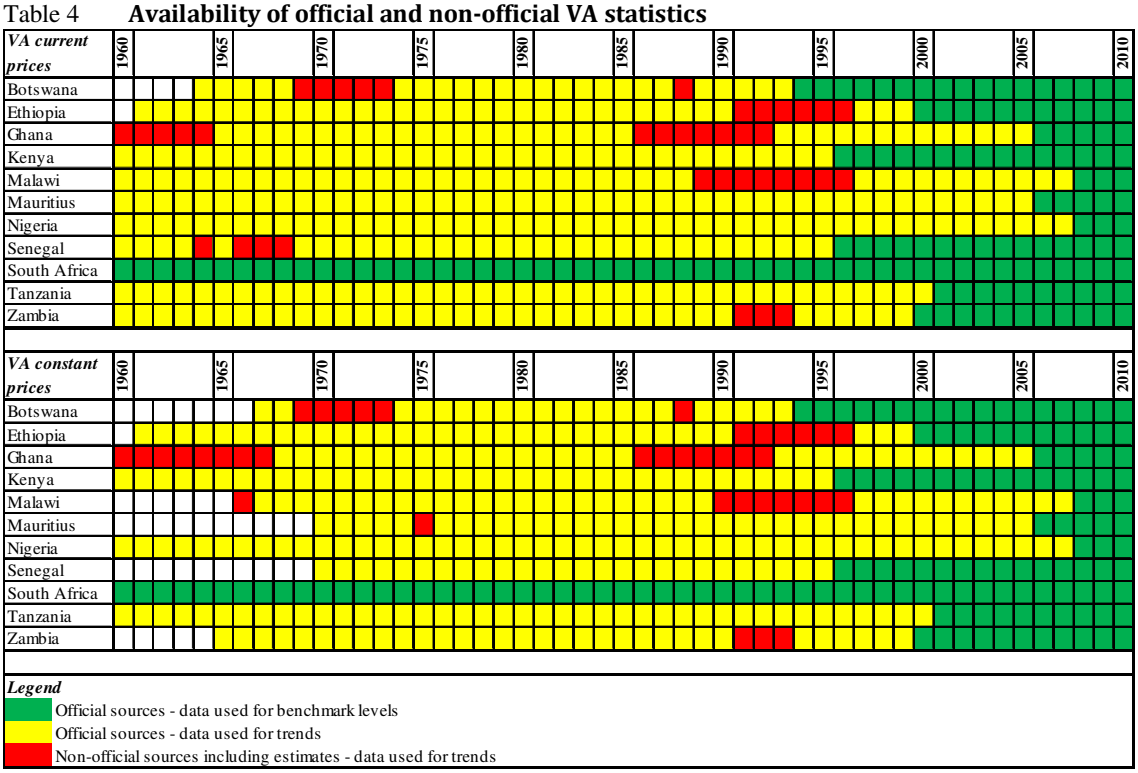
In a nutshell, VA data in the Africa Sector Database correlates fairly well with existing international datasets, although the ASD uses additional official data to fill gaps and resolve breaks in the time series. Alternative datasets on employment by sector in Africa are largely absent or provide sporadic employment numbers that are not consistent over time. Therefore, we believe the biggest improvement of the Africa Sector Database is in providing consistent long-term employment numbers by sector.

4. Value Added

Synopsis of the main points

- We make a distinction between 'official' (NSI produced), and 'non-official' (estimates) sources.
- Official NSI data is used as the primary source.
- Non-official data is used to bridge gaps in official data using growth trends.
- When detailed sector data is missing, we use growth trends of aggregate sectors.
- The most recent revision of the NA data is used as the benchmark level data.
- Historical series are linked using growth rates, which ensures consistency over time.
- We estimate nominal and price deflator series from the source data and derive volume data implicitly

Table 4 **Availability of official and non-official VA statistics**



This section discusses the collection and approach of the source statistics used to construct the value added data in the ASD. These sources provide the raw data which are used to compile the database. We also discuss the general methodology used to compile the VA series in current and constant prices. Country specific notes can be found in the appendix.

General approach

Gross value added in current and constant prices is taken from the National Accounts (NA) of the various countries. As these have all been compiled according to the UN System of National Accounts, international comparability is high, in principle. However, national statistical institutes frequently change their methodologies. In the NA, VA series are periodically revised which includes changes in the coverage of activities (for example after a full economic census has been carried out and "new" activities have been discovered), changes in the methods of calculation (for example the inclusion of software expenditures as investment rather than intermediate consumption), and changes in base year of the prices used for calculating volume growth rates. Our general approach in constructing the VA

series is to start with VA levels for the most recent available benchmark year, expressed in that year's prices, from the NA provided by the National Statistical Institute or Central Bank. Historical NA series are subsequently linked to this benchmark year. This linking procedure ensures that growth rates of individual series are retained although absolute levels are adjusted according to the most recent information and methods.

4.1 Sources

At independence, many African countries had some national accounting tradition set up by the colonial authorities. The newly established National Statistics Institutes (NSI) initially only produced nominal values of VA. At a later stage estimates for volumes of VA were added. The national accounts (NA) were often computed with technical assistance from the United Nations (UN). This was done according to the UN System of National Accounts (SNA), with the exception of Senegal which only adopted this system in their latest revision (1999 prices).

In the construction of the database we start by using statistics from official sources and when necessary complement these with data from non-official sources. Table 5 below presents the main sources for the VA data in the ASD in current and constant prices. We discuss them according to the general hierarchy in which they are used. Table 4 gives an overview of the availability of official VA statistics in current and constant prices by country.

Table 5 **VA data sources**

Official sources		*Acronym*
(1)	National Statistics Institute statistical bulletins and research publications	NSI
	UN *Yearbook of National Accounts Statistics*	UN YB
	Online database of UN Official Country Data	UN OCD
Non-official sources including estimates		*Acronym*
(2)	UN Economic Commission for Africa, *African Statistical Yearbook*	UNECA, ASYB
	Online database of UN Estimates[8]	UN E

Official sources (1)
Country-specific sources, including statistical bulletins and research publications published by NSI's, are our most important source for official data. NSI's are the producers of all official NA data. Collection and dissemination is being conducted by these offices, usually in collaboration with the national Central Bank and/or the ministry of Finance. These statistics are collected from the NSI websites, libraries and archives. Generally only the most recent updates of the national accounts are available directly from NSI websites and typically continuous series cover less than twenty years. The level of sectoral detail by which VA data is reported varies across countries and periods, but is sufficient for the ten sectors in the ASD.

The UN is an important outlet for official national accounts data provided by the NSI, for both the latest updates as well as historical series. Furthermore, parallel series of different revisions of the NA are provided. The UN publishes NA statistics through their UN YB and UN OCD. The UN YB has been published since 1958 and has since used various sectoral classifications. In addition to these yearbooks, NSI official data is published online under the UN data portal (UN OCD), and uses the ISIC Rev.3.1 classification.

[8] The UN term for these data series is 'UN Official Estimates'.

Non-official sources including estimates (2)
When available we use the official statistics. However, for years for which no official data is produced by the NSI we use the estimates produced by UNECA or UN E. We should note however that these organizations do not report in detail how they arrive at these estimates.

The UNECA office also reports official NSI data through yearbooks (ASYB) which have been published since 1970, however, they produce their own estimates when official data is missing. These estimates are produced roughly for the late eighties and early nineties where official statistics for various countries are missing. VA data is classified by ten sectors of the economy, that match the ASD sector list.

Whenever the aforementioned sources do not provide sufficient data to produce continuous series, we add information from additional non-official sources. The UN E provides continuous data for the period 1970-2010 for seven sectors: Agriculture (AtB); Manufacturing (D); Mining and Utilities (C+E); Construction (F); Trade services (G+H); Transport services (I); Other services (J-P).

4.2 Methodology

In constructing continuous sectoral VA series our approach is to use the data from the most recent NA revision as the benchmark level data. When the NSI revises its national account statistics, the base year for volume data is changed to a more recent year. Level estimates and the historical series are revised as well. In order to avoid breaks and jumps in the series, we have to link historical VA series to the latest benchmark level data using growth rates, this ensures data consistency over time. In some cases where official data is missing, we have to resort to non-official sources to provide sectoral growth trends. Some of these sources contain statistics at a lower level of sectoral detail. The growth rate of the aggregate sector is then applied.

The current (nominal) and constant price (volume) VA series at the ten sector level are constructed as follows; the nominal time series are constructed by linking historical data to the benchmark level estimates, see Equation (1). Deflator growth rates are calculated at the sectoral level, using the nominal and volume data from the same source. This results in continuous series of nominal VA data and price deflators at the sectoral level, see Equation (2). Finally, sectoral volume series of VA are constructed by deflating the nominal values, see Equation (3). The resulting data in constant prices is presented in the ASD as an index expressed in 2005 prices. Total economy values for VA_Q05 are derived as the simple sum of all sectors.

For each sector back casted values from the benchmark years are calculated using:

Equation (1) $$VA^t = VA^{t+1}/(VA_e^{t+1}/VA_e^t)$$

Where VA_t denotes nominal Value Added at year t, and VA_e^t the VA data from an external source. Deflator growth is calculated for each sector using:

Equation (2) $$\Delta VA\_P^{t+1} = LN\left(\left(\frac{VA_e^{t+1}}{VA\_Q_e^{t+1}}\right)/\left(\frac{VA_e^t}{VA\_Q_e^t}\right)\right)$$

Where ΔVA_P^t denotes the logarithmic growth of the price deflator in year t; and VA_e^t and $VA\_Q_e^t$ are the nominal and volume data in year t from an external source.

Sectoral volume data is calculated using:

$$VA\_Q^t = VA\_Q^{t+1} / EXP(\Delta VA^{t+1} - \Delta VA\_P^{t+1})$$

Equation (3)

$$\text{Where: } \Delta VA^{t+1} = LN\left(\frac{VA^{t+1}}{VA^t}\right)$$

Where VA_Q^t is the sectoral volume index for year t.

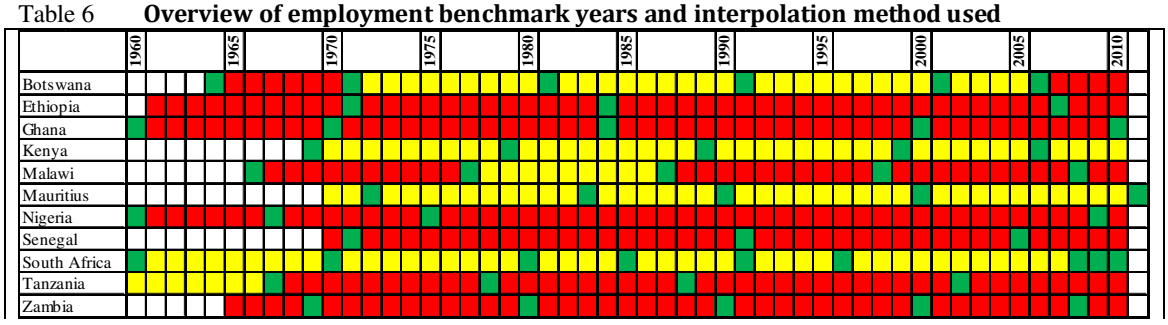
Estimating volume data from separately constructed series of VA and price deflators has a number of advantages. In cases where statistics at the detailed sector level are missing, we assume that growth trends of the aggregate sector are representative of the underlying detailed sectors. It is more reasonable to make this assumption for price developments than for volume growth rates. In addition, this method allows us to add information on price developments from external sources, such as the consumer price index, when this is not available from primary sources.

5. Employment

Synopsis of the main points

- Employment is defined as all persons engaged, aged 15 years and older.
- We use census data as the primary source of our benchmark level estimates.
- Census data is checked for reliability and if necessary replaced or supplemented by LFS data.
- Survey data is used to interpolate employment levels between benchmark years.
- FAO data is used for trends of agricultural employment between benchmark years.
- Back casts/extrapolations from the first/last benchmark are done based on survey data.
- In case no survey data is available interpolation or back casts/extrapolations are based on average labour productivity growth between benchmark years.

Table 6 **Overview of employment benchmark years and interpolation method used**



Legend		Back casting	Interpolation	Extrapolation
	Benchmark level estimates			
	Trend from Establishment Survey	Equation (8)	Equation (4)	Equation (7)
	Trend from average labour productivity growth	Equation (10)	Equation (5)	Equation (9)

This section discusses the collection and approach of source statistics used to construct the employment data in the ASD. These sources provide the raw data which are used to compile the database. We also discuss the general methodology used to compile the employment series. Country specific notes can be found in the appendix.

General approach

Employment in our data set is defined as 'all persons employed', thus including all paid employees, but also self-employed and family workers.[9] Labour input is normally not available from a country's national accounts as they are not part of the System of National Accounts.[10] Four different primary sources of employment exist, namely the Population Census (PC); the Labour Force Survey (LFS) and other Household Survey's (HS) with data collected at the household level; and Establishment Survey's (ES) which are based on firm-level questionnaires. Generally we use the PC to arrive at benchmark estimates and interpolate the data in between using ES data. In some cases the LFS and/or HS are used to adjust the PC data, as explained in subsection 5.2.1. We distinguish between two methods of interpolation, depending on data availability. When ES data is available interpolation is based on annual growth trends. When this data is unavailable, interpolations are based on average trends in labour productivity between the benchmark years. The agricultural employment figures are

9 Ideally, hours worked should be collected as well, but this data is irregular and sparse and only covers the formal sector.

10 Most OECD countries nowadays provide sectoral employment figures alongside GDP in the national accounts but this practice has not been adopted by less-developed countries.

interpolated using growth rates from the FAO data series on the economically active population in agriculture.

5.1 Sources

Employment in our data set is defined as 'all persons employed', thus including all paid employees, self-employed and family workers. The preferred age boundary is 15 years and older. Ideally, labour input in productivity estimates should be measured in hours worked. However, the data, insofar available, is irregular and these statistics typically only cover the formal sector. A split in employment by gender is generally available for all sources discussed. Exceptions are described in the country notes. In the discussion below we make a distinction between primary sources and the publications from which they are taken.

5.1.1 Primary sources

Labour input is not available from a country's national accounts as it is not part of the SNA. Table 7 below presents the primary sources of our employment series. We will discuss these sources according to the hierarchy in which they are used.

Table 7 **Employment data sources**

Primary Source		*Acronym*
(1)	Population and housing census	PC
(2)	Labour force survey	LFS
(3)	Household survey	HS
	➢ *Priority survey*	
	➢ *Living standards measurement survey*	
	➢ *Welfare monitoring survey*	
	➢ *Demographic health survey*	
	➢ *Population survey*	
(4)	Establishment survey	ES
(5)	Food and Agriculture Organization data on the economically active in agriculture (1960-2010)	FAO
(6)	ILO Estimates of employment-to-population ratios (1991-2010)	ILO E

Population and housing censuses (1)

The Population Census generally offers a complete count of the population and in most cases data on employment is collected as well. Although the information given in the PC is not as detailed as in the LFS, it provides the most reliable level data on sectoral employment. Therefore, the PC level data on employment is taken as the benchmark estimate in the ASD, for years in which PC statistics on employment are available. However in some cases the PC results are unreliable (see discussion below) and therefore not used, this is indicated in the country notes. For some countries survey data is used to supplement the level estimates in the benchmark years, since in some PC's level employment is available but the sectoral distribution is not. Table 8 presents an overview of the years for which PC benchmark employment statistics are used and for which countries this data is supplemented with survey data.

Table 8 **Employment benchmark sources used**

Country	1960s	1970s	1980s	1990s	2000s	2010s
Botswana						
Census	1964	1971	1981	1991	2001	
Survey					2006	
Ethiopia						
Census			1984		2007*	
Survey		1970			2007	
Ghana						
Census	1960	1970	1984		2000	2010
Survey						
Kenya						
Census		1979*	1989*			
Survey	1969	1978	1989	1999	2006	
Malawi						
Census	1966*	1977	1987	1998	2008	
Survey	1969					
Mauritius						
Census		1972	1983	1990	2000	2011
Survey						
Nigeria						
Census						
Survey	1960, 1967	1975			2009	
Senegal						
Census						
Survey		1971		1991	2005	
South Africa						
Census	1960	1970	1980, 1985	1991, 1996		
Survey					2000-2010	
Tanzania						
Census	1967	1978#	1988#		2002	
Survey		1991	1991			
Zambia						
Census	1969		1980	1990	2000	
Survey					2008	

** For these censuses the sectoral distribution is taken from the surveys in the year below.*

 # For these censuses employment by occupation is available, the survey below is used to allocate occupations to sectors.

Labour Force Surveys (2)
The LFS is a comprehensive and well-established source with substantive international harmonization of concepts as it uses definitions set out by the International Labour Organization (ILO). However, sampling sizes and techniques differ substantially between countries. The LFS is a household survey and covers employees as well as self-employed and family labour. The main problem with LFS statistics is the lack of consistency with output data from the national accounts. Particularly at the sectoral level consistency problems arise due to the relatively small sample sizes, often less than 1 per cent. In addition, samples are sometimes restricted to specific regions, such as urban areas which can lead to biased results. Another drawback of the LFS is that very few surveys have been held in the early post-colonial period, as most African countries started to implement household survey programs in the 1980s. However, for countries, years and sectors for which LFS data is available and sample sizes are sufficiently large, we use the LFS to adjust the level benchmark data.

Household Surveys (3)
Although the LFS is a household survey, we distinguish it from the various other household surveys that include questions on employment in their questionnaires. A number of these surveys, listed in table 3.2, have been conducted, generally since the 1990s, to measure the effect of the structural adjustment programs. Since it is not their primary aim to capture labour force characteristics, they often provide limited information on the labour force and employment indicators can be unreliable or inconsistent. Therefore these surveys are only used in cases where these statistics are deemed to be sufficiently reliable.

Establishment Surveys (4)
Since for all countries in ASD, the time interval between African censuses is at least ten years, additional sources are used to interpolate between the benchmark years. The Establishment Survey generally reports labour force statistics, consistent with value added measures in the national accounts, since output series for the national accounts are often based on these surveys as well. However, while ES coverage is reasonably accurate for goods producing industries, this is not always the case for services. Moreover, the ES typically only covers firms that surpass a certain threshold, such as a lower bound on the persons employed or a certain turnover level. This excludes smaller firms, which are abundant in developing countries. Another limitation is that data on self-employed and unpaid family members are usually not collected. This makes the ES less suited as a source for agricultural employment and informal parts of the economy, where family work accounts for a considerable share in employment. However, since the ES is held annually, we use this source for trends in employment for other sectors.

FAO data and ILO estimates (5,6)
These two databases provide continuous time series of non-official data. These numbers are estimated, usually by applying econometric models, and are used in the ASD to provide trends. The FAO produces time-series on the economically active population in agriculture for all African countries for the period 1961-2010. Therefore FAO data is only used for trends in agricultural employment. The only exception is Botswana, for which details can be found in the country specific sources and methods document. The ILO E produces its own estimates of total employment figures for all African countries for the period 1991-2010. In this ILO dataset the figures are harmonized and include the employed population aged 15 years and older.

5.1.2 Source publications

Our source statistics are taken from various libraries, archives and online databases, shown in Table 9. We generally prefer the country-specific publications and census micro data to data provided by the ILO, since it provides us with the most detailed information. This allows us to manipulate the statistics to match the ASD data characteristics such as the sector classification or the lower age boundary.

Country-specific publications include census and LFS reports, periodically published statistical bulletins and research monographs. For some censuses micro data is freely accessible through AICMD. The AICMD provides one per cent census samples for a number of African countries, produced by the NSI.[11] In addition, the ILO collects and disseminates official data through their online portal, Laborsta, and their statistical yearbooks. The online portal provides data from 1969 onwards, while the yearbooks are published since 1935.

Table 9 **Source publications for employment statistics**

Source Publications	
Country-specific publications	
➢ *Census and survey reports*	
➢ *Periodically published statistical bulletins*	
➢ *Research publications*	
Online database African Integrated Census Micro data	AICMD
Online database ILO Laborsta	
ILO *Yearbook of Labour Statistics*	ILO YB

5.2 Methodology

In constructing time series for sectoral employment our general approach is to take the PC as the benchmark level. In order to estimate employment trends in between benchmark years we take the growth trend from additional data sources to make interpolations. These interpolations are normalized on the average annual growth trend in between benchmark years, this ensures data consistency over time. We back cast or extrapolate from the first and last benchmark estimates by using survey data.

5.2.1 Benchmark level estimates

Levels for sectoral employment are in principle taken from the PC. However, census data is not always reliable and sometimes disputed (for a further discussion see section 7). To check the reliability of the data we perform a number of checks. First, total employment to total population ratios are calculated for the entire period using population data from the Maddison historical statistics (Maddison 2009).[12] Whenever these ratios are between 30 and 40 per cent we consider these ratios to be credible. These boundaries are based on average ratios derived from the PC and LFS figures from the African countries in the ASD. As an example, for the Ethiopian 1994 census we found that the ratio exceeded 50 per cent, which leads us to exclude it from the ASD estimates. Second, the sectoral trend from consecutive censuses is also checked for correlation with value added data. Finally, we check the PC coverage of female employment using survey data. Female employment constitutes an important part of the agricultural labour force, usually around or above half of total employment in that sector. Whenever we find patterns not in line with the established criteria we supplement or

[11] The AICMD provides samples for the following countries: Ghana (2000), Malawi (1987, 1998, 2008), Senegal (1988, 2002), South Africa (1991, 1996, 2001), Tanzania (1988, 2002).
[12] This data can be found at: http://www.ggdc.net/maddison/ .

replace the PC as a source for benchmark level estimates by using LFS or HS data. Table 8 shows the sources of the benchmark estimates for each country.

5.2.2 Interpolation methods

We distinguish between two methods of interpolation, depending on data availability. When ES data is available interpolation is based on annual growth trends. When this data is unavailable, interpolations are based on average trends in labour productivity between the benchmark years. The agricultural employment figures are interpolated using growth rates from the FAO data series on the economically active population in agriculture.

Interpolation based on ES and FAO data

The level estimates for all sectors are interpolated between benchmark years using annual growth rates from the ES or FAO (external) data. To accommodate the annual fluctuations, but at the same time retain the levels in the benchmark years, we employ a procedure which uses the average annual growth trend between the benchmark years, supplemented with information on the annual deviations from this trend, taken from the external data.

For each sector, the interpolation method can be expressed mathematically as follows:

Equation (4)

$$EMP^t = EMP^{t-1} * EXP\left[LN\left(\frac{EMP_e^t}{EMP_e^{t-1}}\right) - LN\left(\frac{EMP_e^{b2}}{EMP_e^{b1}}\right)/(b2-b1) + LN\left(\frac{EMP^{b2}}{EMP^{b1}}\right)/(b2-b1)\right]$$

Where: $b1 < t < b2$

Where $b1$ and $b2$ denote the first and second benchmark, and $(b2-b1)$ the number of years in between. Sectoral employment is denoted by EMP, in year t. The e subscript indicates external employment data.

Interpolation based on average trends in labour productivity

For years in which no ES data is available, we interpolate between benchmark years using average sectoral productivity growth rates. We calculate real sectoral productivity levels by taking the output to employment ratio. These productivity levels are then linearly interpolated. In turn we divide the sectoral volume data by the sectoral productivity level to arrive at the employment estimate for a particular year.

For each sector, the interpolation method can be expressed mathematically as follows:

Equation (5)

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

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

Where $b1$ and $b2$ denote the first and second benchmark year, and $(b2-b1)$ the number of years in between. Sectoral employment is denoted by EMP, in year t. Sectoral VA in constant prices is denoted by VA_Q^t and labour productivity by LP. This method is used, since it allows us to harmonise movements in value added and employment. Linearly interpolated employment figures may be inconsistent with the growth trends of VA, resulting in irregular productivity patterns.

Interpolation of employment by gender

Sectoral employment estimates by gender are calculated from the same sources as mentioned above. However, the interpolation of the figures of male employment is done according to a different methodology. For each sector we linearly interpolate the shares of male employment in total employment between the benchmark estimates using:

Equation (6)
$$\theta^t = \theta^{t-1} * \text{EXP}\left(LN\left(\frac{\theta^{b2}}{\theta^{b1}}\right)/(b2-b1)\right)$$
Where: $b1 < t < b2$

Where θ^t denotes the share of male employment at time t; $b1$ and $b2$ refer to the two benchmark years between which is interpolated. We use this method in order to avoid numbers of male employment to exceed total employment, as for some sectors the share of male employment is close to hundred per cent. Extrapolation or back casting is done by assuming constant shares of male employment.

5.2.3 Extrapolation and back casting methods

Analogously to the interpolation methods we calculate back casts and extrapolations using two methods. In cases where external data is available, we use these sectoral trends to back cast or extrapolate from the nearest benchmark estimate.

For each sector, the extrapolation and back casting method using external data can be expressed mathematically by Equation (7) and Equation (8) respectively:

Equation (7) Extrapolation: $$EMP^t = EMP^{t-1} * \left(\frac{EMP_e^t}{EMP_e^{t-1}}\right)$$

Equation (8) Back casting: $$EMP^t = EMP^{t+1} / \left(\frac{EMP_e^{t+1}}{EMP_e^t}\right)$$

Where sectoral employment is denoted by EMP^t in year t. The e subscript indicates external employment data.

Whenever no ES statistics are available, we back cast or extrapolate using the average annual labour productivity trends between the last two benchmark years. For each sector, the extrapolation and back casting method using average annual labour productivity between the two closest benchmark years can be expressed mathematically by Equation (9) and Equation (10) respectively:

Equation (9) Extrapolation: $$EMP_E^t = \frac{VA\_Q^t}{LP^{t-1}} / EXP\left[LN\left(\frac{LP^{b2}}{LP^{b1}}\right)/(b2-b1)\right]$$ Where: $t > b2$; $LP^t = \frac{VA\_Q}{EMP^t}$

Equation (10) Back casting: $$EMP_E^t = \frac{VA\_Q^t}{LP^{t+1}} / EXP\left[LN\left(\frac{LP^{b2}}{LP^{b1}}\right)/(b2-b1)\right]$$ Where: $t < b1$; $LP^t = \frac{VA\_Q^t}{EMP^t}$

Where $b1$ and $b2$ denote the first and second closest benchmark years, and $(b2 - b1)$ the number of years in between. Estimated employment is denoted by EMP_E^t, in year t; VA in constant prices by VA_Q^t; labour productivity by LP.

Since no sectoral employment statistics are available, Equation (9) and Equation (10) are based on the assumption that the average annual labour productivity between the two closest benchmark years is representative of the extrapolated or back casted years. However, total economy estimates are available for the period 1991-2010 from the ILO E. We use the trend from this data to estimate total economy employment levels and normalize the sectoral results from Equation (9) to this level, using:

Equation (11) Total Employment: $$EMP_{TOT}^{t} = EMP_{TOT}^{t-1} * (EMP_{ILO}^{t} / EMP_{ILO}^{t})$$

Equation (12) Normalization: $$EMP^{i,t} = EMP_{E}^{i,t} * \left(\frac{EMP_{TOT}^{t}}{\sum_{j=1}^{S} EMP_{E}^{j,t}} \right)$$

Where EMP_{TOT}^{t} denotes the total economy employment level, and EMP_{ILO}^{t} ILO E the total employment level, in year t. $EMP_{E}^{i,t}$ denotes the estimated employment level, based on average annual labour productivity levels between the two closest benchmark years, for sector i. Finally, $EMP^{i,t}$ denotes the employment level in sector i, normalized to the total economy employment level estimated in Equation (11).

This method adjusts the sectoral labour productivity growth estimates to be in line with total economy productivity growth trends. Ideally the same method should be applied for the back casted series, however no total economy employment series are available for the early period.

6. Purchasing Power Parities for sectors

To measure relative labour productivity levels, a key issue is how to convert real value added into common currency units. Conceptually, the appropriate rate of exchange is a purchasing power parity (PPP). In addition, by now it is well known that relative prices vary substantially across tradable and non-tradable sectors, such that the use of aggregate PPPs is not appropriate (Inklaar and Timmer, 2012). Therefore, we use sector-specific PPPs for our labour productivity measures. Relative prices across sectors are based on price data collected by the World Bank in the 2005 ICP round except for agriculture, which is based on unit value information from FAO.

6.1 Data sources

We base our sector PPPs on data from the internationally coordinated surveys on expenditure prices for 2005 under the auspices of the United Nations and the World Bank, see World Bank (2008). These price comparisons are based on purchasers' prices of final goods and services with a detailed product specification. The sector PPPs are based on the basic heading PPP and expenditure data of the International Comparisons Project (ICP) for 2005. These parities refer to 126 items of final expenditure and cover household consumption, investment and government consumption. The 126 basic heading PPPs are allocated to one or more of the sectors in the database based on the type of product, so, for example, prices for transport services are allocated to the transport & communication sector. In some cases, a basic heading category is relevant for more than one sector. For instance, manufactured products will also be sold by the wholesale and retail trade sector. We also include output prices and quantities for up to 168 agricultural products from the FAO.[13] These cover both livestock and crops and are useful to estimate the output prices of the agricultural sector which cannot be derived from expenditure prices as output in this sector consists predominantly of intermediate, rather than final goods.

Some caveats apply. First, we use output PPPs instead of value added PPPs. Second, for Business services (J+K), limited basic headings are available to estimate a PPP and we use the total consumption PPP instead. For Government services (L,M,N) only input prices, not output prices, are available. Finally, the expenditure data is at purchasers' prices, with no adjustments for margins and taxes (see Inklaar and Timmer, 2012).

6.2 Methodology

We use the GEKS procedure to aggregate the detailed basic heading prices into sector PPPs using the expenditure information as weights. In computing the GEKS aggregate price index, we first compute Fischer indices using all countries in turn as the base country. The GEKS index is then a geometric mean of all Fischer indices. See also Balk (2008). A limitation of these sector PPPs is that the basic heading PPPs are at purchaser prices, so including all tax and distribution margins, while the appropriate price concept would be at basic prices. Furthermore, prices of products that are exported are not taken into account. Inklaar and Timmer (2012) show how to deal with these issues for a more limited set of countries. For countries for which we have FAO data on agricultural prices and production, we prefer those, since these prices are farm-gate prices, rather than prices of food at a

[13] Downloaded from http://faostat.fao.org on October 27, 2010.

later stage of processing. To aggregate the detailed prices, we use an expenditure-weighted country-product dummy (CPD) method. This method can easily cope with the many missing prices (since countries do not typically produce all crops or type of livestock) and yields results that would be numerically close to the GEKS method (see Prasada Rao, 2005). Whenever FAO-based PPPs are not available, we use a GEKS aggregate of ICP food PPPs.

7. Data quality

In this section we discuss the quality of the data. First we discuss the consistency and then the reliability of African statistics in general. We review literature on African statistics in relation to the source data of the countries included in the ASD. We describe the main issues and limitations of our value added and employment estimates. In general we note that growth rates comparisons are more reliable than comparisons of absolute levels. The error in the change from year to year is likely to be less compared to the absolute values if the NSI only considers the probable change from the previous year. Also, real growth rates are more reliable than nominal growth rates because many surveys measure changes in production and not values. Finally, using 5 to 10 year averages of real growth rates is likely to suffer from the least bias.

7.1 Consistency

The ASD is constructed to be intertemporally, internationally and internally consistent. Through our linking procedure as described in section 4, the series have been smoothed by repairing major breaks, thereby assuring intertemporal consistency. International consistency of the cross-country sectoral data is ensured by the application of the SNA framework for the measurement of Gross Domestic Product (GDP) in the sources we use. By using a consistent employment concept of persons engaged across countries and employing a harmonized sector classification (ISIC Rev. 3.1), international consistency of these variables is provided. For the derivation of meaningful productivity estimates, the labour input and output measures should cover the same activities, that is, they should be internally consistent. As we use persons employed as our employment concept rather than employees, and base our employment numbers on large-scale surveys, our employment and value added variables match. However, a notable exception is the imputation of rents, which is added to GDP in many countries, according to the System of National Accounts. This imputed production does not have an employment equivalent and should preferably not be included in output for the purposes of labour productivity comparisons. Therefore, the ASD database presents separate series for imputed rents.

7.2 Reliability of African statistics

African statistics are often considered to be unreliable. Recently, various scholars have pointed out anew that the statistical foundations underlying GDP and employment estimates in Africa are subject to large measurement errors, and have referred to these weak fundamentals for growth and productivity analysis as 'Africa's statistical tragedy' (Devarajan, 2013; Jerven, 2013). The low quality of the statistics is related to a weak capacity to collect, manage, and disseminate the data; inadequate funding of statistical offices; diffuse responsibilities on who is collecting what; and fragmentation in surveys and gathering exercises (Devarajan, 2013).

The quality of statistics in Africa varies over time. Broadly speaking, statistical quality went through three major waves (Lehohla, 2008). During the first wave, roughly from the 1960s to the 1970s, African statistical offices developed national accounts based on the SNA using methods learned during the colonial regime. In addition, population censuses and household surveys were implemented. During the second wave from the 1980s to the 1990s, the quality of statistics deteriorated. The 1970s' oil crises, currency instability, and related political events created a comprehensive change in the prospects for African states (Ellis, 2002). Due to an increase in informal

activities, the quality and scope of available data has gradually deteriorated. More recently, however, there has been a revival in the quality of statistics for Africa. Various statistical offices have implemented surveys and censuses to obtain a more accurate measure of economic activities within their national borders.[14]

The World Bank's Bulletin Board on Statistical Capacity measures the capacity in countries to collect, manage and disseminate data. This measure is based on various indicators, such as the frequency of updating the base year and the most recent SNA framework used. The statistical capacity levels for 2010 are shown in column (4) of Table 10. The level ranges from 0 to 100. For reference, the average level in Europe and Central Asia is 81. The average level for Sub-Saharan countries combined is 58, while the ASD average level is 70. This suggests that most countries included in ASD rank relatively favourable in terms of statistical capacity compared to other African countries.

7.3 Reliability of GDP estimates

In this subsection we elaborate on the reliability of GDP estimates for Africa. We use the term GDP, but we note that in our database the measure applied is value added (VA).

1960s and 1970s: Early post-colonial period

The official compilation of national accounts (NA) rapidly expanded during the 1950s (Ady, 1962) and many countries started to publish estimates of GDP. These statistics were in most cases obtained by using the production approach (Blades, 1980). Ady argues that rapid improvements in the NA estimates took place during the early years. Column (1) in Table 10 shows the initial year for which GDP estimates are available, column (2) shows when the time series start. Blades uses the NSI's qualitative assessments of the reported numbers to estimate the error ranges of GDP by sector. Typically, the error range of the GDP estimate is large for traditional activities within sectors, especially for subsistence agriculture. In column (3) of Table 10 we present the error range for aggregate GDP presented by Blades, which is twice the standard deviation of the estimate. That is, the 95 per cent confidence interval is equal to the value added estimate is plus or minus the error range percentage. The average of the error range for the five African countries is approximately 20 per cent. This suggests that the GDP estimates for Africa in the 1970s are about twice the US error in the 1940s, according to Blades. Although the error is substantial, it is probably not much worse than the estimates for Asia and Latin America in the same period. In addition, many surveys tracked a large part of economic activity and, in principle, the SNA provides an excellent framework for the measurement of economic activities and various firm and household surveys were put in place to track economic activity.

As we discuss in section 4, our method is to link the most recent revision of value added levels to past series using annual growth rates. Therefore, errors in estimates of growth rates are more relevant. Typically it is assumed that the same error in value added levels applies to annual changes (Morgenstern, 1965). However, the absolute error margin in the change from year to year is likely to

[14] Ironically, discussion by scholars on the quality of statistics for Africa follows these waves. The early wave saw notable discussions from Bondestam (1973) and Blades (1980) and an issue on national accounts data in the Review of Income and Wealth in 1962. During the second wave, when data quality rapidly deteriorated, there was also limited attention from academics. After 2000, when many statistical offices started to improve statistical practice, we observe a revival in attention by researchers, culminating in a recent special issue in the Review of Income and Wealth on the quality of Africa socio-economic data (vol.59:2, 2013).

be lower compared to the absolute values if the NSI only considers the probable change from the previous year. This implies that in this case annual changes have different and lower error margins. Unfortunately, GDP growth rates are typically not systematically examined for their reliability. Blades suggests that African GDP growth rates may have a (two sigma standard) error of 3 percentage points in the 1970s. However, he also notes that growth rates averaged over five to ten year periods are more accurate compared to annual changes.

Table 10 **Reliability of GDP estimates**

Country	*First estimate of GDP (in current prices)* *(1)*	*Start of time series* *(2)*	*Error margin (1970)** *(3)*	*Statistical capacity level (2010)*** *(4)*	*Latest revision of the base year* *(5)*	*SNA currently used* *(6)*
Botswana	1964	1974	17%	57	2006	SNA93
Ethiopia	1961	1961		77	2011	SNA93
Ghana	1965	1965		66	2006	SNA93
Kenya	1947	1947	15%	62	2001	SNA93
Malawi	1955	1955	22%	79	2007	SNA08
Mauritius	1950	1950		77	2006	SNA93
Nigeria	1950	1951	27%	69	1990	SNA68
Senegal	1959	1969		74	1999	SNA93
South Africa	1946	1946		80	2005	SNA93
Tanzania	1952	1954	19%	68	2001	SNA93
Zambia	1955	1955		59	1994	SNA93

* Error margin is the mid-point estimate presented in Blades (1980). This number (± per cent) gives the 95 per cent confidence interval of the GDP estimate.

** Figures taken from The World Bank's Bulletin Board on Statistical Capacity.

1980s and 1990s: Decline of statistical capacity

During the late 1970s and 1980s economic realities in Africa changed. The inherited set of surveys and inquiries were less capable of accurately capturing the rising share of informal economic activities. Also, capabilities by statisticians deteriorated, partly due to limited funding. At a conference of African statisticians held in 1977, the United National Economic and Social Council laid out a set of weaknesses in the national accounts estimates (ECA, 1977).

Agricultural output and GDP estimates were based on the 1970 round of agricultural censuses in which 30 African countries participated. This provided a good point estimate, but subsequent annual agricultural surveys were not undertaken in order to gauge variations in output from year to year (ECA, 1977). Export crops, for which the quantity of production can be assessed through purchases and changes in stocks at marketing boards, can be estimated over time. Food crops were based on eye estimates, traditional fishing catches were not reported, and changes in livestock for many species were not tracked. In addition, limited information on intermediate consumption often implies the use of rough input-output coefficients to measure GDP.

In manufacturing, the growing output of small-scale industries and handicrafts usually went unreported. Some countries tried to estimate these activities using area sample surveys. For many construction activities, particularly those relating to own account construction and farm buildings in rural areas, information is not available. This also relates to data on ownership of dwellings and their imputed rents. Some countries roughly estimated imputed rents in urban areas, while others, Ghana and Botswana, to this day do not include separate estimates of these series. Only a few countries tried to impute rental value for owner-occupied dwellings in rural areas. Data on distributive trade and transport services was limited. Sometimes countries used a 'mark up' method, applying estimated trade margins to the value of (only partly known) locally produced and imported goods. Data for

transport services, such as ton-kilometres and passenger-kilometres, were usually not available or based on rare small-scale sample surveys or inquires. In a nutshell, the main weaknesses relate to tracing agricultural output over time, and measuring services sectors' GDP and unorganized activities. Overall, this implies that GDP estimates in the 1980s and 1990s were increasingly unrepresentative of the total economy.

2000s: Recent revisions and improvements

In recent years, many NSIs have undertaken a substantial revision of their GDP estimates. New surveys were conducted that aimed at getting a better hold on economic activity within the territory. This has led to substantial revisions in GDP levels. For example, Ghanaian GDP was revised upwards by 62 per cent in 2010. Similarly, Malawi revised its GDP upward by 30 per cent. A revision for Nigeria is still pending. The most recent revision of GDP was published by Ethiopia, which changed its base year from 2000 to 2011 (Ministry of Finance and Economic Development 2013). This revision amounted to a minor 1 per cent change in GDP level. In column (5) of Table 10 we show the latest revision of the base year and in column (6) the SNA framework currently in use. Outdated base years signal lower reliability of the statistics. In support of the recent improvements in statistical quality, many African countries included in the ASD have a recent base year.

7.4 Reliability of employment estimates

In section 5 we motivate the choice to use population censuses as the basis for the employment estimates in ASD. Here we outline the main issues and several possible solutions. Detailed solutions on a country-by-country basis are described in a separate document, available at www.gddc.net/asd.

Coverage and concept issues

Many scholars have noted that various (modern) concepts used in measuring the labour force are not aligned with economic reality in Africa, especially during the early post-colonial period (Kpedekpo and Arya, 1981). For example, Egerö and Henin (1973) note that in Tanzania there is no adequate translation in Swahili to distinguish between occupation and industry, and people are used to associate being employed with wage employment. This implies that cross-classifying workers by sector and work status is difficult for Tanzania and for other countries as well. Another important issue concerns the measurement of underemployment. Many African workers are neither fully employed nor wholly unemployed. Especially in agriculture where all family members help in the work at the farm. As a result, there will be substantial differences in unemployment rates between rural and urban areas. Employment in the ASD is defined as all persons engaged, and thus includes paid employees, as well as self-employed and family workers.

Historically, there have been inconsistencies in the way Sub-Saharan African countries have treated those engaged in small-scale farming. There has been a tendency to classify small-scale farmers as inactive rather than employed, and particularly in the case of women, whose farming activities may have been seen as an extension of their household work (Posel and Casale, 2001). This practice differs across countries and is partially related to religion and culture. Senegal appears to exclude women from agricultural employment in early post-colonial censuses, whereas they are included in the labour force in later censuses. Similar trends can be observed for Tanzania and Zambia. We adjust employment numbers to include female workers in the labour force when there is a clear bias in reporting females as household workers only. Sometimes this involves the use of additional labour force surveys, as is the case for Senegal and Zambia.

Some census results are heavily contested, like the ones held in Nigeria in 1963, 1973 and 1991. Our solution here is to use surveys, suggested by country experts. In most cases the PC figures are used in conjunction with surveys, mostly the LFS. Table 8 shows the main source of sectoral employment level estimates and the benchmark years for countries in the ASD.

Differences in age limits and reference periods of the labour force enumerations may impair cross-country and intertemporal consistency. In the source data, typically no upper age limit is imposed, but there is usually a lower age limit, which varies from 6 to 15 years. Typically the contribution of children to production is small. To facilitate comparability of the employment data of the ASD countries with the Asian and Latin American countries in the GGDC 10-sector database, we only include persons aged 15 years and older in the labour force. Exceptions to this rule are mentioned in the country notes document. Our preferred reference period is the last 12 months, since this includes seasonal workers in agriculture.

8. Concluding remarks

Comparative studies of sectoral growth have been hampered by the lack of a large-scale international database on output and productivity trends by sector in developing countries. This document presents the Africa Sector Database (ASD) developed by the Groningen Growth and Development Centre (GGDC), which is the first database to provide long-term series on sectoral developments in Africa. The database is constructed on the basis of an in-depth study of available statistical sources on a country-by-country basis. We discussed the contents of the database, the selection procedure of the sources, and the methods used to ensure intertemporal, international and internal consistency. Compliance with consistency requirements is important to ensure the usefulness of the database in long-term analyses of growth and productivity.

We hope and believe the Africa Sector Database will support the conduct of policies aimed at facilitating structural change in African countries.

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Africa Sector Database

Sources and Methods by Country

10. Botswana

Synopsis of the main points

- Use of SNA93 for recent years in official statistics.
- Gaps in the GDP data for the first decade after 1966. We use linear interpolation.
- Continuous official GDP data in current and constant prices is available for the period from 1974-1988 and 1989-2010. For the period 1988-1989 we use sectoral trends from UN estimates.
- Consistency problems in vintages of LFS and census rounds for agricultural employment. We use FAO data.

10.1 Introduction

Background to the National Accounts statistics of Botswana

The first national accounts estimates for Botswana were prepared around independence in 1966. There are several gaps in the series for the first decade after independence.[15] However, from 1974 onwards the NSI estimated GDP annually, with the exception of 1988/1989 for which no overlapping year exists between NA series. Recently, GDP has been revised, taking 2006 as the new base year. The rebasing caused total GDP to decline by roughly 10 per cent in 2006. The economic structure has also been affected; in particular the share of the mining sector in total economy value added dropped from 43 to 32 per cent (NSI 2012).

Estimating subsistence agriculture in employment

For the compilation of historical sectoral employment statistics for Botswana, the main challenge has been to obtain reliable employment statistics for agriculture that include subsistence farming. The primary sources used are the population censuses and the last Labour Force Survey (LFS), held in 2005/2006. The 1964 and 1971 census figures for agricultural employment are not comparable with the 1981, 1991 and 2001 census data, because the timing and reference period of the last three do not take seasonal workers into account. There are also consistency problems for the last two LFS, conducted in 1995/1996 and 2005/2006. The first survey was held during off-peak season, while the second was held during peak season.

10.2 Sectoral Value Added

This section describes the methods used to obtain continuous series of nominal sectoral value added (VA) and the corresponding price developments in the sector. Volumes of VA in the ASD are implicitly derived from these series by deflating the nominal data with the price deflator, expressing the volumes in 2005 base year prices. Different sectoral data sources have been used for different periods, according to the availability and quality of the data.

0 shows the sectoral data sources that are used for each time period. We start in the most recent years for which the level data is used as the benchmark source for nominal VA. For earlier periods growth rates from the sectoral data sources are used to link the series to the benchmark level data. Data on sectoral price developments is taken from the same source as the nominal data, unless otherwise indicated. In cases where data for detailed sectors is missing, growth rates of aggregate sectors are applied, as indicated in the table.

[15] See Jerven (2010) for a discussion on Botswanan GDP data.

Sectoral VA data sources

Period	*Sectoral data source*	*Notes*
1994-2010	Quarterly GDP bulletin (NSI, 2012)	Level data used for nominal VA.
1989-1994	UN Official Country Data (UN OCD)	Trend used.
1988-1989	UN Official Estimates (UN E)	Trend used. GDP by 7 sectors: Agriculture (AtB), Manufacturing (D), Mining/Utilities (C+E), Construction (F), Trade services (G+H), Other Services (J-P).
1974-1988	UN OCD	Trend used.
1971-1974	UN E	Trend used. GDP by 7 sectors: Agriculture (AtB), Manufacturing (D), Mining/Utilities (C+E), Construction (F), Trade services (G+H), Other Services (J-P).
1965-1971	African Statistical Yearbook 1974 (ASYB)	Trend used. No data for Mining (C); Manufacturing (D) growth rate is applied. No split of Services (J-P). No information on prices available prior to 1967. No data available for 1969 and 1970. Data for this period has been linearly interpolated.
1964-1965	UN National Accounts Yearbook 1970 (UN YB)	Trend used. No information on prices available.

Construction notes on Value Added Series

- The NSI benchmark series do not use the ISIC Rev. 3.1 sector codes. Data for the sector 'General government services' is mapped to the Government services sector (L,M,N); data for the sector 'Social and personal services' is mapped to the social and Personal services sector (O,P). The descriptions for the other sectors perfectly match the ISIC descriptions.
- Values for Dwellings (70) are missing for the entire period. In the ASD values for Dwellings (70) are estimated using the yearly share of dwellings in Financial services (J+K) from Mauritius. Data from Mauritius is used because it has a similar country size and economic structure compared to Botswana. Furthermore, the Mauritian level of statistical capacity is relatively developed as compared to other African countries.
- The source data for Trade services (G+H) for the years 1993 and 1994, taken from the UN OCD, shows an implausible increase of 100%. This jump has been smoothed by applying the 1994/1995 growth rate.
- GDP deflator growth rates for Trade Services (G+H) for the years 1980/81 and 1987/88 show implausible figures of +104% and -75%. We replaced these deflator growth rates by the aggregate growth rates.
- Overlapping data for the two UN OCD data series for 1974-1988 and 1989-1994 is missing. Therefore sectoral data for 1988-1989 from the UN OE series is used to bridge the gap and link the series.
- For the period 1968-1973 continuous national accounts data is lacking from official sources.
    - For the period 1971-1973 we fill the gap by using UN E data.
    - For the period 1965-1971, data from the ASYB (1974) is used. There is a gap between 1968 and 1971, which is filled by linear interpolation. See Equation (6), then θ^t denotes the VA data at time t.
- The UN YB of 1970 provides continuous sectoral GDP estimates for 1964-1966 and is linked using growth rates to estimate 1964 figures. Price information is not available from this source.

10.3 Employment

This section provides detailed information on the sources used to estimate the employment time series. 0 shows an overview of the years for which census data (PC), Labour Force Surveys (LFS) or additional surveys are used as the benchmark level data. Interpolation methods between the benchmark years are discussed in the construction notes.

Employment sources

Year	*Primary sources*	*Source publication*
2006	Sectoral employment levels from the 2005/2006 LFS	ILO Laborsta
2001	Sectoral employment levels from the 2001 PC	ILO Laborsta
1991	Sectoral employment levels from the 1991 PC	NSI (1995)
1981	Sectoral employment levels from the 1981 PC	NSI (1987)
1971	Sectoral employment levels from the 1971 PC	NSI (1972)
1964	Sectoral employment levels from the 1964 PC	ILO YB (1966)
1996 and 2006	Total number of agricultural workers from McCaig et al. (2011) based on the LFS 1995/96 and 2005/06	
1964-2010	Trend data used from FAO Economically active population in Agriculture series	FAO
1971-2006	Sectoral trend from the Survey of Employment and Employees (ES)	ILO Laborsta
2006-2010	Trend for total employment taken from ILO Estimates of employment-to-population ratios	ILO E

Construction notes on employment series

- Due to the aforementioned consistency problems in the PC and LFS data, we use the estimates from McCaig et al. (2011) that are build up from the micro data of the LFS to estimates. The total number of agricultural workers for 2006 can be obtained, but not for 1996. For 1996 and 2006 we do observe the number of workers on own/family lands/cattlepost or farm (165,394 in 1996 and 201,756 in 2006). We use the ratio of these workers to total agricultural workers in 2006 (236,107/201,756) to estimate total agricultural workers in 1996. Trend data is taken from FAO. There is a break in the FAO figures for 1979. We use 1980/1981 growth rates to arrive at an estimate for 1979 and back-cast the series to 1964 using growth rates.
- For the remaining sectors, PC data for the years 1964, 1971, 1981, 1991 and 2001 are used as the benchmark figures for employment. For more recent years no census data is available, therefore the 2005/2006 LFS is used to provide the final benchmark. The level estimates of the LFS are consistent with the census estimates for earlier periods.
- Interpolation, extrapolation and back casting is done using the following sources and methods:
    - 1971-2006: We use ES data and equation (4) to interpolate between the benchmark estimates in this period. The ES was held annually, in august, from 1972 to 1984 and from 1985 onwards bi-annually in March and September. To arrive at benchmark year 1971 the average growth of labour productivity between 1971 and 1981 is applied to the 1972 figures, using equation (10).
    - For the period 1964-1971 and 2006-2010 no trend is available from the ES. The employment numbers are estimated using average productivity growth rates between benchmark years using equation (5).
    - The employment data is extrapolated using average productivity growth rates between the nearest benchmark years using **Fout! Verwijzingsbron niet gevonden.** and these values have been normalised using the trend from ILO E using equation (11) and (12).

    - The gender shares are linearly interpolated using equation (6), extrapolation and back casting is done by assuming constant gender shares.
- For the 1971, 1981, 1991 census employment data for Financial services (J+K) is implausibly low. These numbers are replaced by figures from the ES. Data for 1971 has been estimated by back-casting the 1972 values using the 1972-1973 growth rate.
- In the 1971 census, employment data for Government services (L,M,N) and Personal services (O,P) is aggregated. The sector distribution of the 1981 census is used to split these sectors.
- In the 1964 census employment data for the sectors Financial services (J+K), Government services (L,M,N) and Personal services (O,P) is aggregated. To split these sectors, the distribution of the 1971 census is used.
- The 1964 and 1971 PC include persons aged 10 years and above as employed, whereas the other censuses and survey's only consider persons aged 12 years and above. These tables do not provide sufficient detail to correct the age level to include employment of 15 years and older.

11. Ethiopia

Synopsis of the main points

- Use of SNA93 for recent years in official statistics.
- Continuous official GDP data in current and constant prices is available for the period from 1961-1991 and 1997-2010. For the period 1991-1997 we use sectoral trends from UNECA estimates.
- The variables for Ethiopia in the ASD refer to present day Ethiopia and thus exclude Eritrea.
- The first Ethiopian PC was held in 1984. Employment data for benchmark year 1970 stems from surveys. For the period 1961-1970 labour productivity growth is assumed constant to estimate employment.
- Data from the 1994 PC is not used due to data quality issues, pertaining to the level of employment and its sectoral distribution.
- Data from the 2007 PC only includes information on the total level of employment. The sectoral distribution stems from the 2005 LFS.

11.1 Introduction

Background to the National Accounts statistics of Ethiopia

GDP estimates for Ethiopia are available from 1961-1991 and 1997 to the present. Data for 1992 to 1996 is missing because of the civil war in which Eritrea seceded from Ethiopia. This conflict caused discontinuity in the statistical capacity.

Starting from 2003 the Ethiopian economy has shown high GDP growth rates, in most years above ten per cent. These high growth rates were questioned by international experts (see for example: Gemechu 2010) and it led the IMF to adjust the Ethiopian GDP growth downwards for recent years. In February 2013 the Ministry of Finance and Economic Development, responsible for producing GDP estimates, released new GDP figures with 2011 as the new base year (NSI 2013). In these figures GDP growth is lower compared to the old estimates and hence total real GDP for 2011 is lower by 1% in comparison with the old estimate for this year. These lastly produced figures are used as our benchmark figures.

The Ethiopian fiscal calendar runs from July 8 to July 7. Following the UN statistics we date the figures according to the latest mentioned year, thus 2010/2011 would be 2011.

Our benchmark figures 2000-2010 (and the 1997-2000 data as well) are restricted to Ethiopia without Eritrea. Since we link older data from the period in which Eritrea was still a part of Ethiopia our whole series are limited to the country boundaries which form present day Ethiopia. It should be noted that the share of Eritrean GDP in total Ethiopian GDP is relatively small and the sectoral structure of the economies are very much alike.

Ethiopian Labour Force data

Labour force data for the period before the first Ethiopian PC of 1984 is scarce. Two rounds of a National Sample survey (1964-67 and 1968-71) and two urban based surveys (1976 and 1978), which pertain to questions on the situation of the employed, were conducted. Abegaz (1983, p.49) deems the second survey to be a reliable estimate of the situation of the urban employed. The first LFS was conducted in 1981/82, but is restricted to rural Ethiopia. The first Ethiopian population census was held in 1984, but covered an estimated 80% of the total population (NSI, 1991, pp. 2-3). The employment figures presented in the report are not upwardly adjusted. This adjustment was done by

the ILO, presented in the ILO Yearbook of Labour Statistics (1991). Employment figures from the 1994 PC are not used because of reliability issues. The figures for total employment and sectoral shares from this PC are not reconcilable with the other sources on employment data.

11.2 Sectoral Value Added

This section describes the methods used to obtain continuous series of nominal sectoral value added (VA) and the corresponding price developments in the sector. Volumes of VA in the ASD are implicitly derived from these series by deflating the nominal data with the price deflator, expressing the volumes in 2005 base year prices. Different sectoral data sources have been used for different periods, according to the availability and quality of the data.

0 shows the sectoral data sources that are used for each time period. We start in the most recent years for which the level data is used as the benchmark source for nominal VA. For earlier periods growth rates from the sectoral data sources are used to link the series to the benchmark level data. Data on sectoral price developments is taken from the same source as the nominal data, unless otherwise indicated. In cases where data for detailed sectors is missing, growth rates of aggregate sectors are applied, as indicated in the table.

Sectoral VA data sources

Period	*Sectoral data source*	*Notes*
2000-2010	Ministry of Finance and Economic Development (NSI, 2013)	Level data used.
1997-2000	UN Official Country Data (UN OCD)	Trend used.
1991-1997	African Statistical Yearbook 2000 (ASYB)	Trend used. 'UNECA estimates', no official data is available for this period.
1970-1991	UN OCD	Trend used.
1967-1970	UN National Accounts Yearbook 1975 (UN YB)	Trend used.
1961-1967	UN YB 1970	Trend used.

Construction notes on Value Added Series

- Data for Dwellings (70) for the period 1961-1976 is taken from the UN National Accounts Yearbook editions 1970, 1975, 1979. The share of Dwellings (70) in Business services (J+K) in these sources is used. For the period 1977-1997 J+K growth rates and 1998-2010 part of sector J+K (K - Real estate, renting and business activities) growth rates are used to extrapolate the figures for Dwellings.
- Data between 1991 and 1997 are interpolated using sectoral GDP growth rates from the ASYB 2000. Figures for 1991 are also taken from the ASYB, as the UN OCD for 1991 show strange trends: sectors Mining and Trade (C, G+H) both almost double in size while Government services (L,M,N) almost halves in size.
- Data from the UN YB (1961-1970) for 'Government services' is linked to the sector Government services (L,M,N) and data for 'Community services' to Personal services (O,P).

11.3 Employment

This section provides detailed information on the sources used to estimate the employment time series. 0 shows an overview of the years for which census data (PC), Labour Force Surveys (LFS) or additional surveys are used as the benchmark level data. Interpolation methods between the benchmark years are discussed in the construction notes.

Employment sources

Year	*Primary sources*	*Source publication*
2007	Total employment level from the 2007 Population Census (PC) Sectoral distribution from the 2005 Labour Force Survey (LFS)	(NSI, 2010) (NSI, 2006)
1984	Sectoral employment levels from the 1984 PC Additional information on the distribution of Government services (L,M,N) and Personal services (O,P) from the NSI report	(ILO YB 1991) (NSI, 1991)
1970	Total, rural and urban employment totals from Abegaz (1985) Sectoral distribution for the urban employed from the Survey of 17 medium-size towns (1978) Sectoral distribution for the rural employed from the Rural LFS 1981/82	(Abegaz, 1985) (Abegaz, 1983) (NSI, 1985)
1961-2010	Trend used from FAO Economically active population in Agriculture series	FAO
2007-2010	Trend for total employment taken from ILO Estimates of employment-to-population ratios	ILO E

Construction notes on employment series

- The 2007 PC did not include questions pertaining to the sectoral distribution of the employed population. The total employment figure from this census is consistent with total employment figures from the other two benchmark years. The sectoral distribution is derived from the 2005 LFS.
- The 1984 PC employment data are derived from the ILO and supplemented with shares for Government services (L,M,N) and Personal services (O,P) derived from the census report.
- For benchmark year 1970 various sources are combined.
    - Total employment for 1970 is calculated from the total employment to population ratio as reported by Abegaz (1985). Abegaz calculated this ratio by making adjustments to the figures of the second round of the national sample survey (1968-71). This ratio is multiplied by the total population figure for 1970 as reported by the African Development Indicators Database (august 2011).[16]
    - The sectoral distribution is derived from an urban and rural labour force survey. These are the survey of 17 medium-size towns (1978) for urban sectoral employment, derived from Abegaz (1983), and the rural labour force survey of 1981/82, derived from the NSI report, for rural sectoral employment. Because the reports only present percentages, absolute figures for urban and rural total employment are calculated from Abegaz (1985). Sectoral shares are multiplied by these totals. Sectoral urban and rural employment is aggregated to form total sectoral employment. Finally these sectoral shares are multiplied by our total employment value for 1970.

[16] We deviate from our normal approach because Maddison reports historical population figures for Ethiopia and Eritrea combined.

- Interpolation, extrapolation and back casting is done using the following sources and methods:
    - The employment data in between the benchmark years are estimated using average productivity growth rates between benchmark years using equation (5).
    - The employment data is back casted for the period 1961-1969 using average productivity growth rates between the nearest benchmarks using equation (10). Volume values for sector Mining (C) show unusual jumps and hence labour productivity for this sector is assumed constant for 1961-1970.
    - The employment data is extrapolated using average productivity growth rates between the nearest benchmark years using equation (9) and these values have been normalised using the trend from ILO E using equation (11) and equation (12).
    - The trend from FAO data on the economically active population in agriculture is used for interpolation (using equation (4)), back casting (using equation (8)) and extrapolation (using equation (7)) of the agricultural employment figures.
    - The gender shares are linearly interpolated using equation (6), extrapolation and back casting is done by assuming constant gender shares.
- The employed population refers to persons aged 10 years and older.

12. Ghana

Synopsis of the main points

- Use of SNA93 for recent years in official statistics.
- Continuous official GDP data in current and constant prices are available for the period from 1965(1968)-1986 and 1992-2010. For the period 1987-1992 we use sectoral trends from UNECA estimates.
- The PC is the sole source of the employment estimates.

12.1 Introduction

Background to the National Accounts statistics of Ghana

Ghana has published annual estimates of GDP by sector since 1965 for current and 1968 for constant prices until the benchmark sources used to construct the series became increasingly outdated in 1986. In 1993 a new benchmark was created and GDP was calculated annually from this year onwards. Recently the national accounts series were improved by incorporating new data sources and better estimations methods, classifications and standards, as well as re-basing the volume estimates from the 1993 base year to 2006 (NSI 2010). This led to a 60 per cent upward revision in GDP in 2006 and dramatically altered the structure of the Ghanaian economy. The share of agriculture in GDP fell from 38.8% of GDP to 30.4% in 2006. The share of manufacturing GDP fell by 7.5 percentage points (from 28.3 to 20.8). The share of services in GDP increased from 32.9 per cent to 48.8 per cent. As a result, Agriculture, which had the largest share in the old series, has now been overtaken by services (NSI, 2010).

Ghanaian Labour Force data

In the last 60 years Ghana has held 5 censuses which all included detailed questions on employment and hence are all used as benchmark level estimates. It should be noted however that there are some limitations to the data. The 1960 and 1970 censuses captured information on all those who worked for at least one day for pay or profit during the 4 weeks before census night. In March 1984, this reference period was specified as working for one day during the seven days before census night. The 2000 and 2010 censuses, however, collected information on all people aged 7 years and older who worked for at least one hour for pay or profit or family gain during the seven days before census night. According to the analytical report of the 2000 census this may have given a lower number of people who report themselves working (NSI, 2005).

Furthermore, there are variations in the treatment of unpaid family workers. These variations in the qualification of unpaid family member working for at least one week during the four weeks before census night (1960 and 1970), three days within seven days before census night (1984) and one hour or more during the seven days before census night (2000) are likely to affect the size of unpaid family workers. The shortening of the minimum time of work in the 2000 and 2010 Censuses means that many people may be classified as unpaid family workers, who may not necessarily have been so classified during the earlier census (NSI, 2005, p. 207).

12.2 Sectoral Value Added

This section describes the methods used to obtain continuous series of nominal sectoral value added (VA) and the corresponding price developments in the sector. Volumes of VA in the ASD are implicitly derived from these series by deflating the nominal data with the price deflator, expressing the volumes in 2005 base year prices. Different sectoral data sources have been used for different periods, according to the availability and quality of the data.

0 shows the sectoral data sources that are used for each time period. We start in the most recent years for which the level data is used as the benchmark source for nominal VA. For earlier periods growth rates from the sectoral data sources are used to link the series to the benchmark level data. Data on sectoral price developments is taken from the same source as the nominal data, unless otherwise indicated. In cases where data for detailed sectors is missing, growth rates of aggregate sectors are applied, as indicated in the table.

Sectoral VA data sources

Period	*Sectoral data source*	*Notes*
2006-2010	UN Official Country Data (UN OCD)	Level data used.
1993-2006	UN OCD	Level data used.
1986-1993	African Statistical Yearbook 1996 (ASYB)	Trend used. UNECA estimates, no official data is available for this period.
1968-1986	UN OCD	Trend used.
1960-1968	Statistical Tables on the Economy of Ghana, 1950-1985 (Ewusi, 1986).	Aggregate GDP growth rate used because no sectoral GDP is available. Total economy GDP deflator growth used, hence sectoral shares are constant.

Construction notes on Value Added Series

- Official data is lacking for the period 1986-1992, we use UNECA sectoral estimates.
- Data from the ASYB for 'Government services' is linked to the sector Government services (L,M,N) and data for 'Community services' to Personal services (O,P).
- Values for Dwellings (70) are missing for the entire period. In the ASD values for dwellings are estimated using the share of dwellings in Financial services (J+K) from Mauritius.
- For the period 1960-1968 aggregate GDP estimates from Ewusi (1986) are applied, because of missing sectoral data (nominal data is missing from 1965 onwards and volume data from 1968 onwards).

12.3 Employment

This section provides detailed information on the sources used to estimate the employment time series. 0 shows an overview of the years for which census data (PC, Labour Force Surveys (LFS) or additional surveys are used as the benchmark level data. Interpolation methods between the benchmark years are discussed in the construction notes.

Employment sources

Year	*Primary sources*	*Source publication*
2010	Sectoral employment levels from the 2010 PC report	(NSI, 2012)
2000	Total employment levels from the 2000 PC report Sectoral distribution from the 2000 PC ILO figures	(NSI, 2005) (ILO Laborsta)
1984	Total employment levels from the 2000 PC report Sectoral distribution from the 1984 PC report	(NSI, 2005) (NSI, 1987)
1970	Total employment levels from the 2000 PC report Sectoral distribution from the 1970 PC ILO figures	(NSI, 2005) (ILO Laborsta)
1960	Sectoral employment levels from the 2000 PC report	(NSI, 2005)
1960-2010	Trend used from FAO Economically active population in Agriculture series	FAO

Construction notes on employment series

- Total employment data pertaining to employed persons 15 years and older for the 1960, 1970, 1984 and 2000 censuses is taken from the analytical report of the 2000 census. The 1960 sectoral distribution is also taken from this report, the 1970 sectoral distribution is taken from the ILO Laborsta database.
- In the 1960 and 1970 PC employment data for the services sectors (J-P) is grouped. To split these sectors, we use the distribution of the 1984 PC.
- Interpolation is done using the following sources and methods:
    - The employment data in between the benchmark years are estimated using average productivity growth rates between benchmark years using equation (5).
    - The gender shares are linearly interpolated using equation (6), extrapolation and back casting is done by assuming constant gender shares.
    - The trend from FAO data on the economically active population in agriculture is used for interpolation, using equation (4), of the agricultural employment figures.

13. Kenya

Synopsis of the main points

- Use of SNA93 for recent years in official statistics.
- Continuous official GDP data in current and constant prices is available for the period from 1960(1964)-2010.
- PC data on employment is of limited use, therefore our estimates rely by and large on surveys.

13.1 Introduction

Background to the National Accounts statistics of Kenya

The first official estimates of the domestic income and product of Kenya were prepared in 1947, but data in constant prices is only available for the period from 1964 onwards.[17] Until the 80's the series were rebased every five or ten years (see table 3). After the 1982 revision it took more than two decades to incorporate new sources and methods to create a new benchmark year. In this revision, which was undertaken in 2007 the base year was changed to 2001 using the SNA93 standards.

Kenyan Labour Force data

Kenya has a good record of census taking, but the questions on employment were rather limited and before 1989 even non-existent. The third post-independence population census in 1989 was the first which attempted to collect and analyse in detail information on the labour force. The definition of the employed population in this census is rather vague. Considered as employed are all persons who, during the reference period, worked most of the time for wages, salary, commission, tips, contract and those paid in kind. No specific working time, for example one day or one hour during last week, was asked. Questions on occupation, industry and status were asked but turned out to be useless because of insufficient probing by enumerators and errors in the processing phase leaving a 'not stated' category of 92,3%. The useable labour force information from this PC is that on type of activity, which include: worked for pay or profit, on leave, worked on family holding, no work, seeking work. In the following census, held in august 1999, questions on the labour force were asked but again problems were encountered in processing the data which rendered all information except the economic activity status of the population useless (NSI, 2002, p. 10). Apart from the censuses there is a range of surveys available. Therefore our estimates on employment by sector rely by and large on labour force and establishment surveys and to a lesser extent on population census data.

13.2 Sectoral Value Added

This section describes the methods used to obtain continuous series of nominal sectoral value added (VA) and the corresponding price developments in the sector. Volumes of VA in the ASD are implicitly derived from these series by deflating the nominal data with the price deflator, expressing the volumes in 2005 base year prices. Different sectoral data sources have been used for different periods, according to the availability and quality of the data.

0 shows the sectoral data sources that are used for each time period. We start in the most recent years for which the level data is used as the benchmark source for nominal VA. For earlier periods growth rates from the sectoral data sources are used to link the series to the benchmark level data. Data on sectoral price developments is taken from the same source as the nominal data, unless otherwise

[17] See Jerven (2011b) for a discussion of the Kenyan GDP data.

indicated. In cases where data for detailed sectors is missing, growth rates of aggregate sectors are applied, as indicated in the table.

Sectoral VA data sources

Period	*Sectoral data source*	*Notes*
1996-2010	UN Official Country Data (UN OCD)	Level data used. Complemented with data for Dwellings (70) taken from the Statistical Abstract and Economic Surveys.
1964-1996	Economic Survey (various issues)	Trend used. Data in constant prices is available from 1966 onwards.
1964-1966	UN National Accounts Yearbook 1973 (UN YB)	Trend of GDP in constant prices used.
1960-1964	UN YB 1969	Trend used. No data available on prices and volumes.

Construction notes on Value Added Series

- The UN OCD does not provide data on Dwellings (70). The share of this sector in Business services (J+K) for the period 1996-2010 is taken from the Statistical Abstract 2011 (NSI, 2011) and the 2009, 2005 and 2001 editions of the Economic Survey (NSI various years).
- Our sectoral GDP estimates for the period 1964-1995 are taken from various editions of the Economic Survey (NSI, 1997, 1994, 1991, 1987, 1984, 1981, 1978, 1975, 1971). Both sources present the same data, but we prefer the Economic Survey to the UN OCD because of the availability of more sectoral detail. Furthermore, the UN OCD shows a classification error for ISIC Rev.3.1 industries L and M+N+O for 1991/1992. The total share of L and M+N+O remains the same in both years but the share of L drops from 15% to 4% while the M+N+O share rises from 3% to 11%.
- For the early period sectoral GDP data is taken from the UN YB 1969, thereby applying the 'Public administration and Defence' – which according to a footnote 'includes most government services' – growth rate to Government services (L,M,N) and 'Services' to Personal services (O,P).

13.3 Employment

This section provides detailed information on the sources used to estimate the employment time series. 0 shows an overview of the years for which census data (PC), Labour Force Surveys (LFS) or additional surveys are used as the benchmark level data. Interpolation methods between the benchmark years are discussed in the construction notes.

Employment sources

Year	*Primary sources*	*Source publication*
2006	Sectoral employment levels from the Labour Force Survey 2005/2006 (LFS) report	(NSI, 2008)
1999	Sectoral employment levels from the 1998/99 LFS report	(NSI, 2003)
1989	Total employment from the Population Census (PC) report Sectoral distribution from the Informal sector estimates 1989 and Establishment Survey figures 1989 (ES)	(NSI, 1996) Economic Survey 1981 (ILO Laborsta)
1979	Total employment from the Population Census (PC) Sectoral distribution from the 1977/78 Rural and urban LFS	(UNSD Demographic Statistics) Economic Survey 1981
1969	Sectoral employment figures calculated from Anker and Knowles (1983)	Population Growth, Employment and economic-demographic interactions in Kenya: Bachue-Kenya (Anker and Knowles, 1983)
1969-2010	Trend used from FAO Economically active population in Agriculture series	FAO
1969-2010	Trend from ES data used to interpolate between benchmark years and extrapolate the data.	ILO Yearbook of Labour statistics (1974), ILO Laborsta, 'Kenya Facts and Figures' (NSI, 2007, 2009, 2012), Economic Survey (2005)
	For the period 1989-2008 estimates of sectoral shares of informal sector employment from various Economic Surveys were added to the Establishment Survey figures. We use the trend from these combined sources.	

Construction notes on employment series

- Data for benchmark years 2006 and 1999 are derived from the Labour Force Surveys of 1998/99 and 2005/06.
- Various sources are used to construct the 1989 estimates:
    - Total Agricultural employment: Only five categories of the economically active are available from the 1989 census results: worked for pay or profit, on leave, worked on family holding, no work, seeking work.. We categorise persons of 15 years and older who 'worked on family holding' as agricultural employment. It should be noted that a fraction of this category also includes family businesses other than agriculture. However, the figure for agricultural employment is comparable judging by the trend from our other benchmark years.
    - Total employment: To the number of total agricultural employment we added persons of 15 years and who 'worked for pay or profit' and were 'on leave' to form the level of total employment.
    - The distribution of the remaining sectors is taken from ES data and the NSI calculated informal sector estimates – for sectors Manufacturing (D), Construction (F) and all services except Business services (G+H, I and J-P) – for 1989. While the ES methodology is clearly defined, it is not entirely clear how the NSI estimated these informal sector employment numbers. We used the distribution from the 1999 LFS to split the aggregate 'Government, community and social services' in sectors

Government services (L,M,N) and Personal services (O,P). No data on gender distribution is available from the benchmark sources.

- Various sources are used to construct the 1979 estimates:
    - Total employment: The main source for this benchmark estimate is the 1977/78 LFS, which covered both urban-rural areas and modern-informal components of the Kenyan labour force. The 1981 Economic Survey presents data from this survey as percentages. It also presents percentages of employment per age cohort for the urban and rural segments. We multiplied these percentages by the relevant age cohort population figures from the 1979 Population Census (UNSD Demographic Statistics). In this way we derived total employment figures for persons aged 15 years and older for the urban and rural segments separately.
    - The sectoral distribution for the urban and rural segments from the 1977/78 LFS is applied to these totals (urban and rural total employment) and added up in order to arrive at the sectoral distribution of total employment in Kenya in 1979. We used the distribution from the 1999 LFS to split the aggregate 'Government, community and social services' in sectors Government services (L,M,N) and Personal services (O,P).
- Data for benchmark year 1969 is derived from Anker and Knowles (1983) who used various published and unpublished NSI surveys to arrive at employment estimates covering urban-rural and modern-informal segments (Anker and Knowles, 1983, pp. 399-401). We made some adjustments to their data in order to make it more compatible with the other benchmark figures. Agricultural employment seems implausibly high in comparison with the other benchmark estimates. Therefore it was adjusted using the 1979 benchmark year share of agricultural employment in the FAO economically active population in agriculture for 1979, multiplied by the 1969 FAO figure. Anker and Knowles did not distinguish the sectors Trade services and Business services but instead grouped these into one figure (G+H and J+K). We used the 1979 distribution of these sectors. We used the distribution from the 1999 LFS to split the aggregate 'Government, community and social services' in sectors Government services (L,M,N) and Personal services (O,P).
- Interpolation and extrapolation is done using the following sources and methods:
    - Kenya has a long and continuous tradition of conducting annual Establishment Surveys. We constructed one time series of paid employment by using data of the ES from several sources (1967-1972 from ILO Yearbook of Labour Statistics 1974; 1972-2000 from ILO Laborsta; 2000-2004 from Economic Survey Kenya 2005; 2005-2008 from various issues of 'Kenya Facts and Figures'). We added to these series the estimates of informal sector employment for several sectors (Manufacturing (D), Construction (F), all services except Business services (G+H, I and J-P) for the period 1989-2008. The trend from the resulting series is used to interpolate the benchmark data using equation (4) and extrapolate using equation (7), except for manufacturing for which we used the estimates directly.
    - The trend from FAO data on the economically active population in agriculture is used for interpolation of the agricultural employment figures using equation (4).
    - A gender split is inserted using the following methodology. The benchmarks 1979, 1999 and 2006 benchmark years contain sectoral male employment figures. For the period 1969-1979 the 1979 sectoral male employment shares were used. Sectoral male employment shares for the years 1979-1999 and 1999-2006 are calculated using equation (6).
- The employed population refers to persons aged 15 years and older.

14. Malawi

Synopsis of the main points

- Use of SNA08 for recent years in official statistics.
- No official data (GDP current prices) for the period 1990-1996. We use sectoral trends from UNECA estimates.
- No official data (GDP current prices) for the period 2008-2010. We use data from UN Estimates.
- First PC (1966) contains only limited information on employed. Solved by using ES data.

14.1 Introduction

Background to the National Accounts statistics of Malawi

National accounts for Malawi (called Nyasaland from 1891 to 1964) were first calculated by Miss Phyllis Deane for the year 1938. During the federal period (Federation of Nyasaland and Rhodesia, 1954-1963) a set of national accounts was prepared for Malawi by the Central Statistics Office in Salisbury. Phyllis Deane writes later: "The difficulties in the way of measuring the national income in Africa spring from two main sources. First, the concepts and experience from which the national income estimator usually derives his definitions and methods have for the most part been developed in dealing with advanced industrial economies such as those of the United Kingdom or the United States. How far they are applicable to less advanced economies must be deduced from a series of practical tests. Second, data on which to base estimates are scarce" (Chikoti, Siwinda, Brændvang, & Simpson, 2011, pp. 5-6). With the collapse of the federation an independent Malawi came into existence in 1964 and the task of preparing national accounts fell on the newly established National Statistics Institute (NSI) in Zomba. Its first director Derek W. Blades, known for his studies on the reliability of national accounts in developing countries, prepared a set of national accounts for 1964-1967, published in 1968. In the following decades the base year was not extended as often as the UN SNA framework recommends and there are some gaps in the data. Official current price series estimates are lacking for the period 1990-1996 and 2008-2010 and there is no overlapping year in two constant price series in 1996/1997.

Recently a twinning project between Statistics Norway and the NSI of Malawi, the Ministry of Development Planning and Cooperation and the Ministry of Finance was initiated to enhance the National Accounts (using the SNA08) and rebase the series to 2007 prices. The newly estimated series contain sectoral constant prices data for 2002-2011 and current price data for 2002-2007.

Malawian Labour Force data

The censuses provide the most reliable information of the historical sectoral structure of the employed population of Malawi. There are however some data limitations in comparing the different census employment figures. Questions on employment were very limited and only pertained to the African population in the 1966 census, Malawi's first post-independence census. The African working population was put in the following categories: Own farm produce (reference period 12 months), wage or salary (worked for at least 2 weeks in past 12 months), other cash income (did not work but had some kind of cash income) and none. These categories do not add up to total population. The 1977 census was the first to introduce questions on sectors and data is available on a two digit level. This census differs from the ones held in 1987, 1998 and 2008 in that the reference period for agricultural workers was set to 12 months in order to include the subsistence farmers. In general the employed in the 1977, 1987, 1998, 2008 censuses include categories as Mlimi (subsistence farmers)

and (unpaid) family workers. It is not clear how these seemingly minor differences affect the comparability of the employment figures, but the total employment to total population ratio (15 years and older) seems to be comparable over time and the (change of) sectoral structure seems to follow an expected pattern on the basis of GDP data.

14.2 Sectoral Value Added

This section describes the methods used to obtain continuous series of nominal sectoral value added (VA) and the corresponding price developments in the sector. Volumes of VA in the ASD are implicitly derived from these series by deflating the nominal data with the price deflator, expressing the volumes in 2005 base year prices. Different sectoral data sources have been used for different periods, according to the availability and quality of the data.

0 shows the sectoral data sources that are used for each time period. We start in the most recent years for which the level data is used as the benchmark source for nominal VA. For earlier periods growth rates from the sectoral data sources are used to link the series to the benchmark level data. Data on sectoral price developments is taken from the same source as the nominal data, unless otherwise indicated. In cases where data for detailed sectors is missing, growth rates of aggregate sectors are applied, as indicated in the table.

Sectoral VA data sources

Period	*Sectoral data source*	*Notes*
2008-2010	UN Official Estimates (UN E)	Trend used. GDP by 7 sectors: Agriculture (AtB), Manufacturing (D), Mining/Utilities (C+E), Construction (F), Trade services (G+H), Other services (J-P).
2002-2008	UN Official Country Data (UN OCD)	Level data used.
1997-2002	UN OCD	Trend used. No data for sector Mining (C), we used the Manufacturing (D) growth rate. Aggregate data for sectors L-P applied to benchmark estimates of Government services (L,M,N) and Personal services (O,P)
1990-1997	African Statistical Yearbook 2000 (ASYB)	Trend used. Used because of lack of official data. No data for sector Mining (C), we used the Manufacturing (D) growth rate.
1989-1990	ASYB (1997)	Trend used. Used because of lack of official data. No data for sector Mining (C), we used the Manufacturing (D) growth rate.
1973-1989	UN OCD	Trend used.
1967-1973	UN National Accounts Yearbook 1976 (UN YB) Malawi. Some Historical Statistics (Pryor, 1988)	The data in current prices is back casted from 1973. Constant price sectoral GDP data from Pryor (1988) matches the UN OCD data, but data is available further back to 1967. Price deflators are estimated from these current and constant series.
1960-1967	ASYB (1974)	Trend used. No data for sector Mining (C), Manufacturing (D) growth rate applied.

Construction notes on Value Added Series

- We use UN OCD data with the ISIC Rev. 3.1 classification, except for the 2002-2008 data, for which we use data with the ISIC Rev. 4 classification.
- Current price series are lacking for the most recent years (2008-2010). Sectoral GDP growth rates for these years are derived from the UN E.

- For the period 1997-2001 sectoral growth rates from the UN OCD are used. Government and Personal services (L-P) are aggregated in the source data, the aggregated trend has been applied.
- Sectoral GDP growth rates from the 1997 and 2000 editions of the African Statistical Yearbook have been used for the period for which no official data in current prices exists (1989-1996).
- Estimates for Business services (J+K) for 1963-1966 from the ASYB (1974) have negative values, hence the trend for Business services (J+K) from the UN National Accounts Yearbook 1970 is applied.
- For the period 1960-1965 and 1973-2001 no estimates were prepared for sector Mining (C), we solved this issue by applying the trend from Manufacturing (D).
- Data from the ASYB and UN YB for 'Government services' is linked to the sector Government services (L,M,N) and data for 'Community services' to Personal services (O,P).
- Different sources are used to construct estimates for Dwellings (70). For the period 1960-2001 shares from Mauritius are applied due to inconsistencies in the official data and the general lack of official data. Data is available for the period 2002-2007. The share of 2007 is applied to 2008-2010.
- The methodological notes for the current price series apply to the constant price series as well. In addition, the following note applies to the constant price series only:
    - Data for the period 1967-1973 is taken from different sources because of the lack of constant price series from the sources which were consulted to obtain current price series. We used sectoral GDP constant prices data from a World Bank study (1988) to extrapolate the UN OCD data (both in 1978 prices). In this way deflators are computed with the current prices equivalent in UN OCD database.[18] Data for Government and Personal services (L-P) are grouped and applied to Government services (L,M,N) and Personal services (O,P) separately. While the series start in 1967, deflator growth rates are held constant for 1966 for the purpose of labour productivity estimates for 1966 for which sectoral employment estimates have been calculated.

[18] Unfortunately this source does not provide a current prices series equivalent.

14.3 Employment

This section provides detailed information on the sources used to estimate the employment time series. 0 shows an overview of the years for which census data (PC), Labour Force Surveys (LFS) or additional surveys are used as the benchmark level data. Interpolation methods between the benchmark years are discussed in the construction notes.

Employment sources

Year	*Primary sources*	*Source publication*
2008	Sectoral employment levels from the 2008 PC report Gender split from micro data	(NSI, 2010) (AICMD)
1998	Total employment levels from the 1998 PC report Sectoral distribution from micro data	(NSI, 2002) (AICMD)
1987	Sectoral employment levels from the 1987 PC report	(NSI, 1993)
1977	Sectoral employment levels from the 1977 PC report	(NSI, 1980)
1966	Agricultural employment from the 1966 PC report Total employment from 'Malawi. Some Historical Statistics' (World Bank report) Sectoral distribution (other than agriculture) from the Establishment Survey 1969 (ES)	(NSI, 1967) (Pryor, 1988) (ILO Laborsta)
1966-2010	Trend used from the FAO series on Economically active population in Agriculture	FAO
1977-1987	Establishment Survey (ES)	(ILO Laborsta)
2008-2010	ILO Estimates of employment-to-population ratios	ILO E

Construction notes on employment series

- The 1998 PC report does not present the sectoral distribution, therefore we use micro data from the AICMD database.
- The 2008 PC report does not present the gender split in employment, therefore we use micro data from the AICMD database.
- We used several sources to construct our 1966 benchmark estimates.
    - Total employment figures are derived from a World Bank report (Pryor 1988).
    - Agricultural employment figures are taken from the 1966 PC. In this census the African working population was put in the following categories: Own farm produce (reference period 12 months), wage or salary (worked for at least 2 weeks in past 12 months), other cash income (did not work but had some kind of cash income) and none. These categories do not add up to total population. We assume that most unpaid (agricultural) family workers would be in the last mentioned category. To arrive at agricultural employment estimates, this figure, minus the double count (total workers minus the sum of the categories) is added to the category 'own farm produce.'
    - The remainder of the employed population is computed from the categories 'wage or salary' and 'other'. The distribution of the remaining sectors is taken from the 1969 ES. Sectoral shares for Government services (L,M,N) and Personal services (O,P) from the 1977 census are applied to the 'Community Services' figure. Males account for 90% of employment in the ES data series. Therefore we applied the gender split from the 1977 PC.
- Interpolation and extrapolation is done using the following sources and methods:
    - The employment data in between the benchmark years are estimated using average productivity growth rates between benchmark years using equation (5).
    - The employment data is extrapolated using average productivity growth rates between the nearest benchmark years using equation (9) and these values have been normalised using the trend from ILO E using equation (11) and equation (12).

  - The trend from FAO data on the economically active population in agriculture is used for interpolation (using equation (4)), back casting (using equation (8)) and extrapolation (using equation (7)) of the agricultural employment figures.
  - The gender shares are linearly interpolated using equation (6), extrapolation and back casting is done by assuming constant gender shares.
- The employment figures refer to persons aged 15 years and older.

15. Mauritius

Synopsis of the main points

- Use of SNA93 for recent years in official statistics.
- Continuous official GDP data in current and constant prices is available for the period from 1960(1970)-2010.
- Under coverage of female employment in 1972 and 1983 PC. We use 1986 LFS data.

15.1 Introduction

Background to the National Accounts statistics of Mauritius

At the time the island gained its independence from Great Britain in 1968, national accounting practices were already firmly rooted on the island republic. The first sectoral GDP series in constant prices however were only estimated in the 70's with 1970 as the first base year. Since then every five or six years the base year was shifted according to new information from the quinquennial Census of Economic Activities. The last series, in 2006 constant prices (2006-2012) are calculated following the SNA93 guidelines.

Mauritian Labour Force data

The Mauritian population censuses are the major sources used for our sectoral employment data. Over time the concepts and definitions hardly altered, the major change being the shortening of the reference period from last month to last week in the 1983, 1990, 2000 and 2011 censuses as compared to the 1972 census. However the female labour force seems to be heavily underreported in the 1972 and 1983 PC which is reflected in a low employment to population ratio derived from these censuses (NSI, 1987, p. 23). Apart from the censuses we make extensive use of the LFS, conducted in 1986 and from 1990 onwards annually.

15.2 Sectoral Value Added

This section describes the methods used to obtain continuous series of nominal sectoral value added (VA) and the corresponding price developments in the sector. Volumes of VA in the ASD are implicitly derived from these series by deflating the nominal data with the price deflator, expressing the volumes in 2005 base year prices. Different sectoral data sources have been used for different periods, according to the availability and quality of the data.

0 shows the sectoral data sources that are used for each time period. We start in the most recent years for which the level data is used as the benchmark source for nominal VA. For earlier periods growth rates from the sectoral data sources are used to link the series to the benchmark level data. Data on sectoral price developments is taken from the same source as the nominal data, unless otherwise indicated. In cases where data for detailed sectors is missing, growth rates of aggregate sectors are applied, as indicated in the table.

Sectoral VA data sources

Period	*Sectoral data source*	*Notes*
2006-2010	NSI Historical National Account Series	Level data used. All sectors available.
1976-2006	NSI Historical National Account Series	Trend used.
1975-1976	UN Official Estimates (UN E)	No link year for volumes and prices, Total economy deflator applied to all sectors
1970-1975	UN National Accounts Yearbook 1979 (UN YB)	Trend used. Strange trend in Agriculture (AtB) was smoothed by linear interpolation (see construction notes).
1965-1970	UN YB (1975)	Trend used. No price information available.
1960-1965	UN YB (1966)	Trend used. No price information available.

Construction notes on Value Added Series

- On the website of the Mauritian NSI various historical national accounts series are available. The series published in December 2012, covering the years 2006-2012 in 2006 prices, are used as the benchmark level estimates in the ASD. Sectoral GDP from series '1999-2010', '1990-2002' and '1976-1998' are linked through growth rates. Data for the pre-1976 period is taken from various edition of the UN National Accounts Yearbook.
- For the period 1960-1989 'Producers of government services' data is linked to the sector Government services (L,M,N). The UN YB show a strange trend for Agriculture (AtB) for the years 1973-1975, increasing almost threefold from 1973 to 1974 and jumping from a 31% to a 50% share. This is smoothed by linearly interpolating the data between 1972 and 1976.
- The first constant price series with base year 1970 for the period 1970-1975 stem from the UN YB (1979). There is no official estimate for the overlapping year between this series and the NSI historical series, therefore we use the aggregate deflator for 1975/1976

15.3 Employment

This section provides detailed information on the sources used to estimate the employment time series. 0 shows an overview of the years for which census data (PC), Labour Force Surveys (LFS) or additional surveys are used as the benchmark level data. Interpolation methods between the benchmark years are discussed in the construction notes.

Employment sources

Year	*Primary sources*	*Source publication*
2011	Sectoral employment levels from the 2011 PC report	(Mauritius, 2012)
2000	Sectoral employment levels from the 2000 PC report	(Mauritius, 2001)
1990	Sectoral employment levels from the 1990 PC report	(Mauritius, 1994)
1983	Total employment levels from Labour Force Survey 1986 (LFS) Sectoral distribution taken from the 1983 PC report	(Mauritius, 1987) (Mauritius, 1987)
1972	Sectoral employment levels from the 1972 PC report	(Mauritius, 1974)
1990-2011	Sectoral trend used from 'Historical Labour Force Series – Employed population by economic activity'	(NSI website)
1970-1990	Sectoral trend used from Survey of Employment and Earnings (ES)	(ILO Laborsta)
1970-1983	Trend used from FAO estimates of total economically active population	FAO

Construction notes on employment series

- We worked around the low female coverage in the first two post-independence censuses as follows. For 1983 we use the employment figures from the Labour Force Sample Survey 1986, as recommended by the 1983 PC report. The total employment figure for 1983 was

back casted to 1970 using the trend from the FAO estimates of the total economically active population and equation (8). The sectoral distribution is taken from the 1983 and 1972 PC.

- For 1983 no separate data on Service sectors L-P is available. The 1990 distribution is applied.
- Interpolation, extrapolation and back casting is done using the following sources and methods:
    - 1990-2011: Data for total employment and the gender split between the (census) benchmark years 1990, 2000 and 2011 is interpolated with a constructed 1990-2011 sectoral employment time series. This time series is constructed from various historical employment series presented on the Statistics Mauritius website. Prior to 2004, these series are based on the latest Population Census or Labour Force Sample Survey, updated with data from surveys of establishments and information from various administrative sources. From 2004 onwards the estimates are based on the Continuous Multi-Purpose Household Survey (NSI, 2007, p. 133). We constructed the 1990-2011 series as follows. The most recently published figures (2009-2011) serve as our benchmark series (NSI, 2011). Next, 2007-2009 figures are linked through the use of growth rates (NSI, 2009). Due to a break in the series from 2006, growth rates from revised totals 2003-2007 (from (NSI, 2007)) are applied, and subsequently growth rates of total employment down to 1990 are linked to this total. Next, the relative shares of the sectors are applied to these new total employment figures. The trend from the resulting series is used to interpolate the benchmark data using equation (4).
    - 1972-1990: Total sectoral employment between the benchmark years 1972, 1983 and 1990 is interpolated using the Survey of Employment and Earnings. This establishment based survey was first conducted in September 1966 and since then carried out on a smei annual basis. Because of weak female coverage, employment by gender is estimated differently. The gender shares are linearly interpolated using equation (6), extrapolation is done by assuming constant gender shares.
    - 1970-1972: The data is back casted using the trend from the ES and using equation (8), while we normalized the total employment figures as mentioned above using equation (11) and equation (12).
- The employed population of the whole series refers to persons aged 12 years and older.

16. Nigeria

Synopsis of the main points

- Use of SNA68 for recent years in official statistics.
- Severely outdated base year (1990), rebasing effort will be published soon.
- Continuous official GDP data in current and constant prices is available for the period from 1960-2010.
- Historical census data is unreliable, instead we make use of surveys.

16.1 Introduction

Background to the National Accounts statistics of Nigeria

The first attempts to measure the National product of Nigeria were undertaken in the 50's by Prest and Steward (Prest & Steward, 1953). According to Jerven the data were far less sophisticated than the theoretical blueprint, and 86 per cent of the total estimates remained 'unclassified' income (Jerven, 2011, p. 17). Prest and Stewart noted problems with applying western concepts on a subsistence based economy like Nigeria. The next national accounts estimates were prepared in 1962 and covered the period 1950-1957 (Okigbo, 1962). Okigbo GDP estimates for 1950 were more than 15% lower compared to the estimates of Prest and Steward, caused mainly by the different valuations of forestry and building production (Eke, 1966). It was not until 1981 that the sources and methods were revised. Professor O. Aboyade, in charge of the revision, noted in the report the shortcomings of statistical methods and that some critical estimates were based on highly tenuous assumptions. In the last revision to date the base year was shifted to 1990. The accompanying report does not evaluate its general validity, weaknesses or the quality but Jerven, using various reports published by the Federal Office of Statistics, notes that the data base on current economic activities is weak and efforts need to be made to drastically improve the series (Jerven, 2011, p. 20). To this date the base year remains 1990 and the SNA93 framework still needs to be implemented. A re-basing effort in which the base year is shifted to 2008 is expected to be published soon.[19]

Nigerian Labour Force data

Measuring the historical size and structure of the labour force for Nigeria is a great challenge, not in the least because the 1963 and 1991 population censuses are deemed unreliable. The 1962 and 1973 censuses were heavily politicised and cancelled because the results were rendered useless. Although the census figures of 1963 and 1991 are officially approved, yet there were complaints of undercount and over count, and even manipulation of figures. The last census of 2006 was less controversial and generally acclaimed to be reliable (Okafor, 2007). However, this census did not contain questions on the employed population and hence is useless to our purposes. It is for this reason that we took a different approach in constructing employment estimates for Nigeria, not using the census results.[20] The most important sources on historical information on the labour market are the various labour force surveys. While their underlying concepts and methods are the same in principle, they show conflicting figures of the size of the employed population and its sectoral structure. We therefore turned to the literature to select sources which reflect the Nigerian situation most accurate. Furthermore, we used sources that follow an expected pattern on the basis of GDP, following the advice of African socio-economic statistics specialists Kdepko and Arya (1981).

[19] See 'Nigerian GDP rebase will alter investor perceptions', October 5 2012, http://www.oxan.com/Analysis/DailyBrief/Samples/NigerianGDPRebase.aspx [visited 22-01-2013].

[20] However, some information from the 1952/53 census is used because this PC was held in colonial times and therefore less subjected to tribal strive as compared to the 1963 PC.

16.2 Sectoral Value Added

This section describes the methods used to obtain continuous series of nominal sectoral value added (VA) and the corresponding price developments in the sector. Volumes of VA in the ASD are implicitly derived from these series by deflating the nominal data with the price deflator, expressing the volumes in 2005 base year prices. Different sectoral data sources have been used for different periods, according to the availability and quality of the data.

0 shows the sectoral data sources that are used for each time period. We start in the most recent years for which the level data is used as the benchmark source for nominal VA. For earlier periods growth rates from the sectoral data sources are used to link the series to the benchmark level data. Data on sectoral price developments is taken from the same source as the nominal data, unless otherwise indicated. In cases where data for detailed sectors is missing, growth rates of aggregate sectors are applied, as indicated in the table.

Sectoral VA data sources

Period	*Sectoral data source*	*Notes*
2008-2010	NSI – Statistical bulletin 2012 quarter 2	Level data used. All sectors available.
1970-2008	UN Official Country Data (UN OCD)	Trend used.
1981-1997	NSI historical GDP series	Data for Government services (L,M,N) and Personal services (O,P) is taken from this source because of a break in the UN OCD series. Data for
1960-1970	NSI historical GDP series	Trend used.
1960-1963	UN National Accounts Yearbook 1966 (UN YB)	The share of Dwellings (70) in Business services (J+K) is used.

Construction notes on Value Added Series

- The website of the Central Bank of Nigeria presents time series covering the period 1960-2009 (in 0 this source is referred to as 'NSI historical GDP series'), but no overlapping years are presented for which different base year estimates were produced and there are large spikes in the series. This source is therefore used in conjunction with the UN Official Country Data, which does present the various base series but only covers the period 1970-2007. The UN OCD data source is used as the main source from which growth rates have been used, but in some instances, as explained below, the NSI historical GDP data is used.
- There are some gaps in the data for sector Personal services (O,P) (growth rates of 3000%) in the UN OCD, therefore growth rates for this sector is taken from the NSI historical series (period 1981-1997). Data for this sector for 1970-1972 is lacking from UN OCD, here the NSI series data is used.
- There is a break in the series for Utilities (E) for the period 1998-2000, we use the trend from another series (from an older revision, available in the UN OCD).
- There is a break in the series for Agriculture (AtB) for the period 2001/2002, use the trend from another series (from an older revision, available in the UN OCD).
- For the period 1960-1969 we used the NSI historical series. We assume that data for Business services (J+K) is included in aggregated data for Government services (L,M,N) and Personal services (O,P) judging by the break in the source data in 1980/81 where J+K rises and L-P plummet whereas the sum of sectors J-P data remains constant. Therefore aggregate growth rates from L-P are used for Business services (J+K) for 1960-69.
- Data for Dwellings (70) is lacking in the UN OCD source. We use the share of Dwellings (70) in Business services (J+K) from the NSI historical series for the years 1994-2010.

Because of a gap in the series we cannot use data for Dwellings for the period 1960-1993 from this source. For 1960-1963 we use the share of Dwellings in Business services from the UN YB 1966. Figures for Dwellings for the period 1963-1993 are interpolated using the trend from Business services and normalized at the end and starting points. See Equation (6), then θ^t denotes the VA data for Dwellings at time t.

16.3 Employment

This section provides detailed information on the sources used to estimate the employment time series. 0 shows an overview of the years for which census data (PC), Labour Force Surveys (LFS) or additional surveys are used as the benchmark level data. Interpolation methods between the benchmark years are discussed in the construction notes.

Employment sources

Year	*Primary sources*	*Source publication*
2009	Total employment ratio taken from '2011 Annual Socio-Economic Report', applied to 2009 population figure from Maddison historical statistics. Sectoral distribution taken from the General Household Survey (HS) (2009) Gender split taken from the 2010 National Manpower Stock and Employment Generation Survey	(NSI, 2011), (Maddison, 2009) (Adeyink, Salau, & Vollrath, 2012) (Statistics, 2010)
1975	Sectoral employment levels taken from 'Total Gainful Employment in 1975'. Total employment to population ratio from this source applied to 1975 population figure from Maddison historical statistics.	(Olayide, 1976), (Maddison, 2009)
1967	Sectoral employment levels taken from Labour Force Sample Survey 1966/67 report	(National Manpower Board, 1972)
1960	Total employment taken from Olayide (1976) Gender distribution from the 1952/53 PC Distribution for sectors other than Agriculture (AtB), Manufacturing (D) and Trade services (G+H) from the Labour Force Sample Survey 1966/67 report	(Olayide, 1976) (National Economic Council, 1959) (National Manpower Board, 1972)
1960-2010	Trend used from FAO series on Economically active population in Agriculture	FAO
2009-2010	ILO Estimates of employment-to-population ratios	ILO E

Construction notes on employment series

- We use various sources to construct our benchmark figures for 2009:
    - Total employment: We apply the total employment ratio taken for 2009 from the '2011 Annual Socio-Economic Report', to the 2009 Nigeria population figure from Maddison Historical Statistics (Maddison, 2009). Because of the unreliability of Nigerian PC data we use population totals from the Maddison historical statistics.
    - The sectoral distribution is derived from a recent study on structural change in Nigeria by Adeyinka, Salua and Vollrath. In measuring labour productivity in Nigeria between 1996 and 2009 they use the General Household Survey (Adeyinka, Salau, & Vollrath, 2012). We use the figures of the 2009 GHS. The gender split is not available in this source and is computed using the 2010 National Manpower Stock and Employment Generation Survey.
- Benchmark estimates for the year 1975 are derived from Olyaide who in turn used figures from the National Development Plan. (Olayide, 1976, p. 22). This source does not contain data on employment by gender.

- The total employment figure for 1960 is computed by applying the total employment to population ratio for 1960 from Olayide (Olayide, 1976, p. 22) to the Maddison total population estimate (Maddison, 2009) of that year. The sectoral structure of employment (for sectors Agriculture (AtB), Manufacturing (D) and Trade services (G+H)) is derived from the results of the 1952/53 PC. According to a 1959 report of the National Economic Council the structure of the labour market in this PC was also representative of 1960 (National Economic Council, 1959, p. 13). The labour force sample survey of 1966/67 is used to estimate the distribution of the other sectors.
- Interpolation and extrapolation is done using the following sources and methods:
    - The employment data in between the benchmark years are estimated using average productivity growth rates between benchmark years using equation (5).
    - The employment data is extrapolated using average productivity growth rates between the nearest benchmark years using equation (9) and these values have been normalised using the trend from ILO E using equation (11) and equation (12).
    - The trend from FAO data on the economically active population in agriculture is used for interpolation (using equation (4)), back casting (using equation (8)) and extrapolation (using equation (7)) of the agricultural employment figures.
    - The gender shares are linearly interpolated using equation (6), extrapolation and back casting is done by assuming constant gender shares.
- The employment figures refer to persons aged 15 years and older.

17. Senegal

Synopsis of the main points

- Use of SNA93 for recent years in official statistics.
- Continuous official GDP data in current and constant prices is available for the period from 1969(1970)-2010.
- Lack of sectoral detail in historical GDP data, which means that aggregate growth rates have been used for some sectors.
- Historical PC data unreliable due to under coverage of female activities and unusable due to lack of questions on the sectoral distribution. Instead we use surveys to construct our employment figures.

17.1 Introduction

Background to the National Accounts statistics of Senegal

Continuous annual sectoral GDP estimates are available from 1969 for current and 1970 onwards for constant prices. However, Senegal's first GDP estimates (in current prices) were made in the sixties. Generally speaking the GDP series have been revised almost every ten years in the post-independence period. Senegal, being a former French colony, compiled their National Accounts in earlier times according to the 'courcier' system. One of the consequences is that some sectors are aggregated. In various UN National Accounts Yearbooks the UN comment that the figures have been adjusted to conform the UN SNA system so far as the existing data would permit. It was not until the last revision, which shifted the base year to 1999, that the UN System of National Accounts framework was entirely adopted (SNA93).

Employment data from Senegalese censuses

The Population Censuses held in Senegal (1976, 1988 and 2002) do not present the most accurate information on the structure and size of the labour market for several reasons. First, female participation is not accurately measured, especially in the 1976 and 1988 censuses.[21] Many females are reported as homemakers, a category of the inactive population. Second, only the 1988 census included a question to measure the sectoral distribution of the labour force, while the other censuses only included questions on status and occupation. From the micro data of the 1988 census (provided for by the AICMD) a cross industry-occupations matrix could be extracted and applied to the 2002 PC occupation figures. In this way we allocated the occupations of this census to sectors using the 1988 blueprint. However, the resulting sectoral distribution for the 2002 census was unusable, showing a 45% share of agriculture which is deemed too low in comparison to other sources. This could be due to the timing of the census, which was December. It is for the above mentioned reasons that the census data are not used to provide benchmarks but, as outlined below, have a minor role in constructing our employment by industry estimates.

Use of the 'National Survey's'

Before the first census of 1976 two 'National Survey's' (EDN - Enquête Démographique Nationale) were held in order to measure the size and characteristics of the population of Senegal, one in 1960-61 and one in 1970-71. The 1970-71 survey was conducted during December 1970 until May 1971. The question to determine employment was not very explicit, namely every individual who worked regularly (included are *aides familial* – family workers). To include seasonal variations in agriculture

[21] The 1976 PC report even leaves out the analysis of female employment because of its marginal size of 6% of the total labour force.

the reference period for agriculture was set to one year, for all other occupations one week. The reasons why we use the figures of this survey instead of the 1976 census are because the EDN made an attempt to produce a realistic measure of female employment in agriculture. The survey was held during off-season (December-May) but an attempt was made to include seasonal employment by adding the unemployed who stated that their last job was agriculture to the employment figure for agriculture (NSI 1973, pp. 11-15). The resulting female to total employment ratio for agriculture is 34%, as opposed to 1% in the 1976 census.

Sources for recent labour market trends

In the last two decades several surveys were conducted which measured (among other things) the size and structure of the employed population. Female coverage in these surveys is deemed more reliable than PC data. For example, the 1988 census shows a share of 25% for female employment in total employment while the 1991 survey shows a more realistic figure of 46%. Two priority surveys were conducted in 1991-92 and 2005-06. The purpose of these World Bank initiated surveys is in the first place to measure the size and characteristics of poverty in Senegal. In between two Household Survey's (Enquête Sénégalaise Auprès des Ménages) were held, in 1994 and 2001. These HS however are not used because they show a strange trend for some sectors (Mining (C) increases tenfold and Manufacturing (D) halves in size). Therefore we used the priority survey data for our employment benchmarks for 1991 and 2005.

17.2 Sectoral Value Added

This section describes the methods used to obtain continuous series of nominal sectoral value added (VA) and the corresponding price developments in the sector. Volumes of VA in the ASD are implicitly derived from these series by deflating the nominal data with the price deflator, expressing the volumes in 2005 base year prices. Different sectoral data sources have been used for different periods, according to the availability and quality of the data.

0 shows the sectoral data sources that are used for each time period. We start in the most recent years for which the level data is used as the benchmark source for nominal VA. For earlier periods growth rates from the sectoral data sources are used to link the series to the benchmark level data. Data on sectoral price developments is taken from the same source as the nominal data, unless otherwise indicated. In cases where data for detailed sectors is missing, growth rates of aggregate sectors are applied, as indicated in the table.

Sectoral VA sources

Period	*Sectoral data source*	*Notes*
1996-2010	UN Official Country Data (UN OCD)	Level data used.
1980-1996	Comptes Nationaux 1980-2004 (NSI website)	Trend used.
1970-1980	UN OCD	Trend used. Several adjustments were made, see the construction notes.
1963-1970	UN National Accounts Yearbook (UN YB) 1978	Trend used. Aggregate growth rates used for Mining (C), Manufacturing (D) and Utilities (E) (C+D+E) and Business services (J+K), part of Government services (M,N) and Personal services (O,P) (J+K,M,N,O). No data for 1964, 1966-1968, which was solved by simple linear interpolation. No data on prices available.
1960-1963	Comptes Economiques, 1959 à 1968 (Diop, 1973)	Trend used. Aggregate growth rates used for Mining (C) and Utilities (E) (C+E) and Business services (J+K) through

		Personal services (O,P) (J-P). No data on prices available.

Construction notes on Value Added Series

- Due to the lack of data the share of Dwellings (70) in Business services (J+K) for the period 1960-1979 is taken from Mauritius. The share of Dwellings in J+K for the period 1980-2010 is taken from NA accounts files from the NSI website.
- We made several adjustments in order to use the 1979 source data for our purposes.
    - ISIC Rev.3.1 industries J+K,M,N,O are combined, hence this aggregate growth rate is applied to sectors Business services (J+K), part of Government services (M,N) and Personal services (O,P).
    - Data for sectors Transport services (I) Business services (J+K), part of Government services (M,N) and Personal services (O,P) is lacking. Here we use the aggregate GDP growth rate.
    - Sector Trade services (G+H) shows a huge jump for 1979/1980. We suspect that the 1979 value (which is halved in the following year) might contain the 'missing' data for ISIC Rev3.1 industries I and J+K,M,N,O. We use the aggregate GDP growth rate.
- The 1963-1969 and 1970-1978 data has limited sectoral detail, we used aggregate growth rates for the following sectors:
    - Mining (C), Manufacturing (D) and Utilities (E)
    - Business services (J+K), part of Government services (M,N) and Personal services (O,P).
- Data for 1964 and 1966-1968 is missing, we interpolated this data linearly. See Equation (6), then θ^t denotes the VA data at time t.
- The methodological notes for the current price series apply to the constant price series as well (data available from 1970 onwards). In addition, the following notes apply to the constant price series only:
    - There is no Business services (J+K) data in constant prices for 1979-1987 in the UN OCD source. In this case we use price information from G+H, because we suspect the information of Business services (J+K) (together with part of Government services (M,N) and Personal services (O,P)) are in this value for G+H value (see above).
    - Constant price data for four sectors are available for the period 1970-1979, in these cases we use aggregate growth rates:
        - Agriculture (AtB);
        - Mining (C), Manufacturing (D), Utilities (E) and Construction (F);
        - Trade services (G+H), Transport services (I), Business services (J+K) part of Government services (M,N) and Personal services (O,P);
        - Part of Government services (L).

17.3 Employment

This section provides detailed information on the sources used to estimate the employment time series. 0 shows an overview of the years for which census data (PC), Labour Force Surveys (LFS) or additional surveys are used as the benchmark level data. Interpolation methods between the benchmark years are discussed in the construction notes.

Employment sources

Year	*Primary sources*	*Source publication*
2005	Sectoral employment levels taken from Enquête de Suivi de la Pauvreté au Sénégal 2005 (HS) report Distribution of sectors Business services (J+K), Government services (L,M,N) and Personal services (O,P) from the 1988 PC micro data	(NSI, 2007) (AICMD)
1991	Sectoral employment levels taken from Enquête sur les priorité 1991 (HS) report Distribution of sectors Utilities (E) and Construction (F) as well as sectors Government services (L,M,N) and Personal services (O,P) from the 1988 PC microdata	(NSI, 1993) (AICMD)
1971	Sectoral employment levels taken from Enquête Démographique Nationale 1970-1971 (HS) report. Gender split for sectors other than Agriculture (AtB) from the 1976 PC micro data	(NSI, 1973) (AICMD)
1970-2010	Trend used from FAO series on Economically active population in Agriculture	FAO
2005-2010	ILO Estimates of employment-to-population ratios	ILO E

Construction notes on employment series

- For the 2005 figures we encountered some difficulties in putting workers which were labelled under 'autres service marchandes' in the appropriate sector. We apply the distribution of sectors Business services (J+K), Government services (L,M,N) and Personal services (O,P) from the 1988 census micro data.
- The 1991 survey report does not distinguish sectors Utilities (E) and Construction (F) as well as sectors Government services (L,M,N) and Personal services (O,P) separately. We use the distribution of these sectors from the 1988 census micro data.
- The report of the 1970-71 survey does not present tables on the gender split of the sectoral distribution of employment. Therefore, the 1976 census figures (using the 1988 cross industry-occupation matrix) are used to compute the gender split for the sectors other than AtB. For more details we refer to section 17.1.
- Interpolation, extrapolation and back casting is done using the following sources and methods:
    - The employment data is back casted for the period 1970-1971 using average productivity growth rates between the nearest benchmarks using equation (10).
    - The employment data in between the benchmark years are estimated using average productivity growth rates between benchmark years using equation (5).
    - The employment data is extrapolated using average productivity growth rates between the nearest benchmark years using equation (9) and these values have been normalised using the trend from ILO E using equation (11) and equation (12).
    - The trend from FAO data on the economically active population in agriculture is used for interpolation (using equation (4)), back casting (using equation (8)) and extrapolation (using equation (7)) of the agricultural employment figures.
    - The gender shares are linearly interpolated using equation (6), extrapolation and back casting is done by assuming constant gender shares.
- The employment figures refer to persons aged 15 years and older.

18. South Africa

Synopsis of the main points

- Use of SNA93 for recent years in official statistics.
- Continuous official GDP data in current and constant prices available from 1946 onwards.

18.1 Introduction

Background to the National Accounts statistics of South Africa

The first estimates of the South African national income were prepared in the 1920s by R.A. Lehfelt and covered the years 1917/18 and 1922/23. With these estimates South Africa was among the first countries in the world which produced estimates of national income. At the time South Africa was part of the British realm as the Union of South Africa. With the statute of Westminster of 1931 the Union was granted independence from the United Kingdom within the Commonwealth and thirty years became completely independent as a Republic. In the early 1940s S.H. Frankel made attempts to estimate national income for 1910/11 and from 1917/18 to 1945/46.

However, it was not until 1946 that the former Bureau of Census and Statistics (at present Stats South Africa – henceforth abbreviated as NSI) started making official estimates of South Africa's domestic product and national income on an annual basis, along with the United States and many European countries. The practice of national accounting in South Africa is a concerted effort of the South African Reserve Bank and the NSI, the first being responsible for compiling the expenditure side as well as income and savings and the balance of payments, the latter being responsible for compiling the production side of the national accounts. Following the UN SNA recommendations the South African GDP has been historically rebased every five years. 2005 is the latest benchmark year and the methodology is still mainly based on the SNA93 framework. The major issue in revising the (historical) sectoral GDP estimates has been to adjust for the exclusion of countries who gained independence from the Republic: Botswana (1966), Lesotho (1966), Swaziland (1968) and Namibia (1990). The former self-governing states and the former Republics of Transkei, Bophuthatswana, Venda and Ciskei have always been and still are included in the national accounts estimates of South Africa (Prinsloo, 2002).

South African Labour Force data

There are three types of sources that refer to the historical size and structure of the South African Labour Market. These are the Population Censuses, (Quarterly) Labour Force Surveys and Establishment Surveys.

South African census taking has a long history, going back to 1798, when every head of a household in the Cape Colony had to submit a return stating the size of his family and the number of slaves and cattle that he owned. For the purpose of our database we focus on the post 1960 censuses. In the 1960 and 1970 censuses there was a full count only for white, coloured and Asian people. A different questionnaire was used for black people, for whom a small sample was enumerated. The 1980 census was the first census that aimed to count all population groups through a uniform data collection methodology (although a question on family structure was not asked of the black population). Due to the unplanned and unstructured nature of certain residential areas, and the inaccessibility of others due to political violence and budget limitations, the NSI decided to use aerial photographs for obtaining estimates of population counts for 83 urban areas and magisterial districts during the 1991 census. The 1996 census was the first census in which the whole country was covered and all residents of the

country were treated equally (NSI, 2007). The questionnaire was now available in all 11 official languages, instead of Afrikaans and English only. The 1970, 1980 and 1985 censuses excluded the homeland territories of Transkei, Bophuthatswana, Venda and Ciskei which held their own (sample) censuses.

Household based survey's are regarded as the most comprehensive and reliable sources of the South African labour market (Daniela Casale, 2004, p. 981). In 1993 the annual 'October Household Survey' (OHS) was launched and was replaced by the biannual Labour Force Survey (LFS) in February 2000. While the OHS collected information from respondents about a diverse range of issues, the LFS focused on the employment situation only. Therefore the latter provides a far more detailed explanation of what constitutes a job, with the aim of capturing irregular and informal work more thoroughly than was the case in the OHS. The LFS was in turn replaced by a Quarterly Labour Force Survey (QLFS) in 2008 which further improved among other things the coverage of informal sector employment. The two surveys are comparable in that they use the same definitions of employment, that is a person is employed who during the reference week worked for pay or profit for at least one hour in the last week (included are unpaid family workers).

The last source on (historical) labour market information under review here is the establishment based survey introduced in the 1950's. This source is in fact a mixture of various enterprise based surveys but presented as one series on the website of the Reserve Bank of South Africa. Two important downfalls of this source are the omittance of agricultural and informal employment. Last but not least there is criticism about the sample, which was not changed for a long time and therefore became increasingly outdated in the nineties (Altman, 2008, p. 128).

18.2 Sectoral Value Added

This section describes the methods used to obtain continuous series of nominal sectoral value added (VA) and the corresponding price developments in the sector. Volumes of VA in the ASD are implicitly derived from these series by deflating the nominal data with the price deflator, expressing the volumes in 2005 base year prices. Different sectoral data sources have been used for different periods, according to the availability and quality of the data.

Table 20 shows the sectoral data sources that are used for each time period. We start in the most recent years for which the level data is used as the benchmark source for nominal VA. For earlier periods growth rates from the sectoral data sources are used to link the series to the benchmark level data. Data on sectoral price developments is taken from the same source as the nominal data, unless otherwise indicated. In cases where data for detailed sectors is missing, growth rates of aggregate sectors are applied, as indicated in the table.

Sectoral VA sources

Period	*Sectoral data source*	*Notes*
1960-2010	UN Official Country Data	Data for Dwellings (70) is not available from this source. No data for sectors Government services (L,M,N) and Personal services (O,P) separately.
1993-2010	GDP Bulletin (NSI)	Share of Dwellings (70) in Business services (J+K) used.
1960-1968	UN National Accounts Yearbook 1969 (UN YB)	Share of Dwellings (70) in Business services (J+K) used.

Construction notes on Value Added Series

- Data for 'Public administration and defence; compulsory social security' is allocated to Government services (L,M,N) and Education; health and social work; other community, social and personal services (M,N,O) and Private households with employed persons (P) to 'Personal Services' (O,P).
- Data for dwellings is not included in the UN OCD data source and is therefore taken from other sources:
    - For the period 1993-2011 various editions of the GDP bulletin published by the NSI (Statistical release P0441) are used. We use the share of Dwellings (70) in Business services (J+K).
    - For the period 1960-1968 we use the share of Dwellings (70) in Business services (J+K) from the UN YB 1969.
    - Figures for the period 1969-1992 are interpolated using the growth of Business services (J+K).

18.3 Employment

This section provides detailed information on the sources used to estimate the employment time series. 0 shows an overview of the years for which census data (PC), Labour Force Surveys (LFS) or additional surveys are used as the benchmark level data. Interpolation methods between the benchmark years are discussed in the construction notes.

Employment sources

Year	*Primary sources*	*Source publication*
2008-2010	Sectoral employment levels taken from the Quarterly Labour Force Survey (2012) report	(NSI, 2012)
1996	Sectoral distribution taken from 2001 PC report	(NSI, 2004)
1991	Sectoral distribution taken from 1991 PC ILO figures	(ILO Laborsta)
1985	Sectoral distribution taken from 1985 PC ILO figures	(ILO Laborsta)
1980	Sectoral distribution taken from 1980 PC report	(NSI, 1985)
1970	Benchmark figures Agriculture (AtB) Other sectors from 1970 PC report	(Lange, 1979) (NSI, 1975)
1960	Benchmark figures Agriculture (AtB) Other sectors from 1960 PC report	(Lange, 1979) (NSI, 1968)
2000-2007	Sectoral trend taken from 2000-2002 Labour Force Survey	(NSI, 2009)
1960-1999	Trend for agricultural employment from FAO figures for economically active population in agriculture	FAO
1971-1999	Trend for total employment taken from total economically active population series from various editions of 'Mid-year Population Estimates'.	(NSI Mid-year Population Estimates)
1970-1999	Trend for sectors other than Agriculture (AtB)	STEE series
1960-1970	Trend for sectors other than Agriculture (AtB)	(Lange, 1979)

Construction notes on employment series

- We created three benchmark 'periods':
    - 2000-2010: The 2008-2010 figures from the Quarterly LFS (QLFS) are used as our benchmark figures. To increase comparability with other African countries in the ASD we included from the various reports of the QLFS 'Subsistence farming' and 'Hunting or fishing for household use' in the figure for Agriculture (AtB). The bi-annually held LFS is used to provide trends for the period 2000-2007 and is linked to the QLFS level data. Figures for the period 2003-2011 originate from two editions of the SSA Labour Market Dynamics reports (2008, 2011) which present historically revised employment series for 2003-2010. Data for 2000-2002 is taken from 'Labour

Force Survey Historical Revision September Series 2000-2007' and is linked to the 2003-2010 figures.

  - 1960, 1970: The figures for benchmark years 1960 and 1970 are derived from a 1979 study by Roukens de Lange (1979). He estimated total employment (informal and formal) using among others the population censuses. We assume that his figures for agricultural employment are more reliable than the census figures. The distribution of the other sectors is taken from the 1960 and 1970 PC.

- Data for the period 1970-2000 is interpolated using the following sources and methods:
  - To provide a uniform continuous total employment estimate we interpolated the total employment data with the trend from the total economically active population from various editions of 'Mid-year Population Estimates' and normalized for the end points using equation (4).
  - The trend from FAO data on the economically active population in agriculture is used for interpolation, using equation (4) of the agricultural employment figures.
  - The distribution of the remaining sectors for the years 1980, 1985, 1991 and 1996 is taken from PC data. We made some adjustments to these figures. We assume that there is a misclassification in all the censuses concerning the sectors Trade services (G+H), Government services (L,M,N) and Personal services (O,P) which was picked up only in the QLFS since 2008. Therefore the distribution of these sectors for all the years for which we use PC data, thus including the 1960 and 1970 data, are based on the QLFS 2008.
- Data for the period 1960-1970 is interpolated using the sectoral trend from the STEE establishment survey figures and normalized for the end points using equation (4). Data for sectors Government services (L,M,N) and Personal services (O,P) are interpolated using average annual productivity growth rates using equation (5).
- The gender shares are linearly interpolated using equation (6).
- The employment figures refer to persons aged 15 years and older.

19. Tanzania

Synopsis of the main points

- Use of SNA93 for recent years in official statistics.
- Tanzania in the ASD refers to Tanzania mainland.
- Continuous official GDP data in current and constant prices is available for the period from 1960-2010.
- The 1978 and 1988 PC data do not contain information on the sectoral structure of the employed. We applied the allocation of occupations by sectors from the 1990/91 LFS.

19.1 Introduction

Background to the National Accounts statistics of Tanzania

The first estimates of the national income of Tanzania cover the years 1952-54 (Peacock and Dosser, 1958). Continuous official GDP data is available for the period from 1960 onwards. After independence in 1964 the Central Bureau of Statistics (NSI), with the assistance of the UN embarked on a detailed and comprehensive revision of the national accounts. Jerven notes that the estimates for agricultural output were sometimes problematic, as for its basic data it sometimes relied on eye observations (Jerven, 2011a). During the late eighties and early nineties the series became increasingly unreliable. Formal activities in the economy declined, after Structural Adjustment Programs forced the Tanzanian government towards liberalization (Jerven, 2011a). Meanwhile the statistical office had to do more with fewer resources. It was not until the next big revision in 1997, changing the base year to 1992 prices, that the growth of parallel/informal markets was picked up. It has been estimated that the size of the unrecorded economy in 1990 was some 30 per cent of official GDP (Jerven, 2011a). In the last revision, conducted in 2007, the base year was changed to 2001 using the SNA93 methodological framework. The Tanzanian national accounts refer to the mainland of Tanzania only.

Tanzanian Labour Force data

Tanzania has conducted four post-independence censuses: 1967, 1978, 1988 and 2002. Over time the concepts and methods hardly altered, they all used for example a long reference period of 12 months. Like most African countries the biggest difficulty lies in what constitutes employed and what not in the setting of a subsistence based economy. Sometimes the demarcation line between employed and unemployed can seem very arbitrary. For example, women who worked on family farms or enterprises for at least one-third of their time were to be classified as employed rather than home-maker. The use of the one third criterion is impossible to apply with any confidence in a subsistence agriculture system in which there are seasonal variations in the time spent by family workers on agricultural activities (Egerö & Henin, 1973, p. 131). The 1967 census analytical report mentions a similar but more practical problem. In Swahili there is no suitable translation to distinguish occupation from industry. This could be the reason for the omittance of questions on industry in the 1978 and 1988 censuses where instead only questions on occupations were asked.

Other important sources are the Labour Force Surveys conducted in 1965, 1990/91, 2000/01 and 2005/06. The first LFS of 1965, prepared by Robert S. Ray (1966), however was very limited in its questions and did not ask for industry or occupation. The last three LFS (which cover Tanzania mainland) are unfortunately incomparable with the census results on employment, as the levels are very different. However it is not clear where these differences arise from since the concepts and

methods are generally the same. Therefore we choose to use the censuses which provide consistent historical data on the level and sectoral structure of employment dating further back than the LFS do.

19.2 Sectoral Value Added

This section describes the methods used to obtain continuous series of nominal sectoral value added (VA) and the corresponding price developments in the sector. Volumes of VA in the ASD are implicitly derived from these series by deflating the nominal data with the price deflator, expressing the volumes in 2005 base year prices. Different sectoral data sources have been used for different periods, according to the availability and quality of the data.

0 shows the sectoral data sources that are used for each time period. We start in the most recent years for which the level data is used as the benchmark source for nominal VA. For earlier periods growth rates from the sectoral data sources are used to link the series to the benchmark level data. Data on sectoral price developments is taken from the same source as the nominal data, unless otherwise indicated. In cases where data for detailed sectors is missing, growth rates of aggregate sectors are applied, as indicated in the table.

Sectoral VA sources

Period	*Sectoral data source*	*Notes*
2001-2010	Economic Bulletin, September 2012, Bank of Tanzania	Level data used. No data on Dwellings (70) available. The share of Dwellings (70) in Business services (J+K) of 2000 is applied.
1998-2001	UN Official Country Data (UN OCD)	Trend used. No data on Dwellings (70) available.
1998-2000	Economic and operations annual report for the year 2001, Bank of Tanzania	Share of Dwellings (70) in Business services (J+K) used.
1992-1998	Economic and operations annual report for the year 2001, Bank of Tanzania	Trend used.
1976-1992	The National Accounts of Tanzania, 1976-1992 (NSI, 1993)	Trend used.
1970-1976	UN OCD	Trend used. Aggregate growth rate of sectors Government services (L,M,N) and Personal services (O,P) applied due to lack of sectoral detail.
1964-1970	UN National Accounts Yearbook 1974 (UN YB)	Trend used. Aggregate growth rate of sectors Government services (L,M,N) and Personal services (O,P) applied due to lack of sectoral detail.
1960-1964	UN YB (1967)	Trend used. Aggregate growth rate of sectors Trade services (G+H) and Business services (J+K) applied due to lack of sectoral detail.

Construction notes on Value Added Series

- No information on the sector Dwellings (70) for the period 2001-2010 is available. We applied the share of Dwellings (70) in Business services (J+K) for the year 2000.
- Some sectors are aggregated in the 1960-1976 source data:
    - 1964-1970: The sectors Government services (L,M,N) and Personal services (O,P) are aggregated. We apply the aggregate growth rates.
    - 1960-1964: The sectors Trade services (G+H) and Business services (J+K) are aggregated. We aply the aggregate growth rates.

19.3 Employment

This section provides detailed information on the sources used to estimate the employment time series. 0 shows an overview of the years for which census data, Labour Force Surveys (LFS) or additional surveys are used as the benchmark level data. Interpolation methods between the benchmark years are discussed in the construction notes.

Employment sources

Year	*Primary sources*	*Source publication*
2002	Sectoral employment levels taken from the 2002 PC report	(NSI, 2006)
1988	Total employment from the 1988 PC report Sectoral / occupations matrix from 1990/1991 LFS	(NSI, 1991) (NSI, 1993)
1978	Total employment from the 1978 PC report Sectoral / occupations matrix from 1990/1991 LFS	(NSI, 1982) (NSI, 1993a)
1967	Sectoral employment levels taken from the 1967 PC report	(NSI, 1971)
1960-1967	Sectoral trend from Establishment survey (ES) series used	ILO Laborsta and ILO Yearbook 1962
1960-2010	Trend used from FAO figures on Economically active population in Agriculture	FAO
2002-2010	Trend used from ILO Estimates of employment-to-population ratios	ILO E

Construction notes on employment series

- The 1978 and 1988 PC data does not contain data on the sectoral distribution of the employed. We apply the allocation of occupations by sectors from the 1990/91 LFS to the 1978 and 1988 data on occupations.
- The figures for Business services (J+K) for benchmark year 1967 are too low in comparison with the ES data. Therefore we used the ES data on J+K for benchmark year 1967.
- Interpolation, extrapolation and back casting is done using the following sources and methods:
    - The employment data is back casted for the period 1960-1966 using the trend from the ES data using equation (8).
    - The employment data in between the benchmark years are estimated using average productivity growth rates between benchmark years using equation (5).
    - The employment data is extrapolated using average productivity growth rates between the nearest benchmark years using equation (9) and these values have been normalised using the trend from ILO E using equation (11) and equation (12).
    - The trend from FAO data on the economically active population in agriculture is used for interpolation (using equation (4)), back casting (using equation (8)) and extrapolation (using equation (7)) of the agricultural employment figures.
    - The gender shares are linearly interpolated using equation (6), extrapolation and back casting is done by assuming constant gender shares.
- The employed population refers to persons aged 15 years and older.

20. Zambia

Synopsis of the main points

- Use of SNA68 for recent years in official statistics.
- Continuous official GDP data in current (and constant) prices is used for the period from 1960(1965)-1991 and 1994-2010. For the period 1991-1994 we use sectoral trends from UNECA estimates.
- Low female coverage in early censuses (1969, 1980, 1990). We use LFS data on female employment instead.

20.1 Introduction

Background to the National Accounts statistics of Zambia

Time series on sectoral GDP in current prices are available from 1955 onwards. At the end of the eighties and early nineties Zambia experienced similar difficulties with its national accounting as Tanzania (Jerven, 2009, p. 288). Structural Adjustment programs caused the informal economy to sore while the resources of the NSI were curtailed. In Zambia this resulted in a break in the annually estimated sectoral GDP for the years 1992 and 1993. In the nineties the data was revised (the base year was overhauled to 1994) and new ways were found to include informal sector activity, which caused overall GDP to rise. The latest revision was done according to the SNA68 framework and it should therefore be noted that the methods as well as the base year are outdated.

Employment data from the Zambian population and housing censuses

Five censuses have been held in the history of post-independence Zambia: 1969, 1980, 1990, 2000 and 2010. For the recent period two labour force surveys are available (2005, 2008). All of the censuses collected the same information on the employed population (economic activity, status, occupation, industry) but over the years the concepts have changed slightly. The 1969 census set the age boundary for the employed population at 15 years and above and the employed were categorized as someone who worked for pay or profit during last week (non-agricultural activities) or last year (agricultural activities). Much was kept the same in the 1980 census except that the age limit was changed to 12 years and above. Furthermore, the definition of employed was changed to having worked at least one day during last week (non-agricultural activities) or last year (agricultural activities). The 1990 and 2000 censuses subsequently changed the reference period and definition of employed, considered as employed in these censuses are persons who worked for pay or profit for any time (non-agricultural activities) or at least one day (agricultural activities) during last week or last year (two reference periods were used for both agricultural and non-agricultural activities).

Under coverage of females in Zambian censuses

Despite the fact that the PC used the same methods to categorize women as 'home makers' or employed there seems to be a large undercount of women in the labour force in earlier years (see table to the right). This could be a cultural phenomenon (women do not report themselves to be employed) but could also be due to insufficient probing by the enumerator (Kpedepko and Arya 1981). The first held LFS in 1986 reports a female employment share of 45%, which suggests that the 1990 census undercounts female workers (Zambia, 1989).

Percentage of females in total employment (census years)				
1969	**1980**	**1990**	**2000**	**2010**
10%	26%	34%	45%	45%

20.2 Sectoral Value Added

This section describes the methods used to obtain continuous series of nominal sectoral value added (VA) and the corresponding price developments in the sector. Volumes of VA in the ASD are implicitly derived from these series by deflating the nominal data with the price deflator, expressing the volumes in 2005 base year prices. Different sectoral data sources have been used for different periods, according to the availability and quality of the data.

The table below shows the sectoral data sources that are used for each time period. We start in the most recent years for which the level data is used as the benchmark source for nominal VA. For earlier periods growth rates from the sectoral data sources are used to link the series to the benchmark level data. Data on sectoral price developments is taken from the same source as the nominal data, unless otherwise indicated. In cases where data for detailed sectors is missing, growth rates of aggregate sectors are applied, as indicated in the table.

Sectoral VA sources

Period	*Sectoral data source*	*Notes*
2000-2010	Monthly Bulletin of Statistics (NSI, 2013)	Level data used. All sectors available except Dwellings (70)
1994-2000	UN Official Country Data (UN OCD)	Trend used. All sectors available except Dwellings (70)
1991-1994	African Statistical Yearbook 1996 (ASYB)	Trend used. Used because of lack of official data.
1970-1990	UN OCD	Trend used. Data for sectors Government services (L,M,N) and Personal services (O,P) is aggregated in this source. Several UN National Accounts Yearbooks were consulted to get separate data on both sectors.
1967-1969	UN National Accounts Yearbook 1976 (UN YB)	Trend used.
1964-1966	UN YB (1970)	Trend used. No data on prices available prior to 1965.
1960-1963	UN YB (1966)	Trend used. No data on prices available.

Construction notes on Value Added Series

- Official data is lacking for the period 1991-1994, we use UNECA sectoral estimates.
- Values for owner-occupied dwellings are missing for the entire period. In the ASD values for dwellings are estimated using the share of Dwellings (70) in Financial services (J+K) from Mauritius.
- The methodological notes for the current price series apply to the constant price series as well. In addition, the following notes apply to the constant price series only:
    - No deflator growth for sector other services (O,P) is available for 1966 and 1967, here we applied the trend from Government services (L,M,N).
    - Data on prices is missing for 1966, data for this year has been linearly interpolated between 1965 and 1967. See Equation (6), with θ^t denoting VA data at time t in this case.

20.3 Employment

This section provides detailed information on the sources used to estimate the employment time series. The table below gives an overview of the years for which census data, Labour Force Surveys (LFS) or additional surveys are used as the benchmark level data. Interpolation methods between the benchmark years are discussed in the construction notes.

Employment sources

Year	*Primary sources*	*Source publication*
2010	Sectoral employment levels taken from 2010 PC report	(NSI, 2012)
2000	Sectoral employment levels taken from 2000 PC report	(NSI, 2003)
1990	Total employment to population ratio from Labour Force Survey 1986 (LFS) report Sectoral distribution taken from the 1990 PC report	(NSI, 1989) (NSI, 1995)
1980	Total employment to population ratio from Labour Force Survey 1986 (LFS) report Sectoral distribution taken from the 1980 PC report	(NSI, 1989) (NSI, 1985)
1969	Total employment to population ratio from Labour Force Survey 1986 (LFS) report Sectoral distribution taken from the 1969 PC report	(NSI, 1989) (NSI, 1973)
1965-2010	Trend used from FAO series on Economically active population in Agriculture	FAO

Construction notes on employment series

- We adjusted the 1969, 1980 and 1990 census figures because of the under coverage of female employment activities. We assume the 1986 LFS figures on female employment to be more credible and assumed the bulk of the 'missing' female employment would be in agriculture. We applied the following method:
    - Total employment was calculated by applying the 1986 LFS employment to total population ratio to the total population figures of the 1969, 1980 and 1990 PC.
    - The levels of employment for the sectors other than Agriculture (AtB) are derived from the PC data.
    - This number (the sum of employment for sectors other than Agriculture (AtB)) was subtracted from the total employment figure to calculate the agricultural employment. In this way the historical sectoral structure and levels of employment are more consistent.
- Interpolation and back casting is done using the following sources and methods:
    - The employment data is back casted for the period 1965-1969 using average productivity growth rates between the nearest benchmarks using equation (10).
    - The employment data in between the benchmark years are estimated using average productivity growth rates between benchmark years using equation (5).
    - The trend from FAO data on the economically active population in agriculture is used for interpolation (using equation (4)) and back casting (using equation (8)) of the agricultural employment figures.
    - The gender shares are linearly interpolated using equation (6), extrapolation and back casting is done by assuming constant gender shares.
- No separate data on sectors Government services (L,M,N) and other services (O,P) is available, therefore this data is aggregated.
- The employed population refers to persons aged 12 years and older.

References

The various sources which have been used to construct the variables in the ASD are divided in three subsections: National Statistics Institutes, International organisations and additional literature. The abbreviation for National Statistics Institute (NSI) in some cases refers to the Ministry of Finance or Central Bank.

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