Structural transformation and inequality in Africa: an investigation into the Kuznets curve

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Abstract

This study aims to contribute to answering the central question of the study **on the concepts, relationships between and causes of poverty, income inequality and economic growth**: "what instruments donors have for helping to reduce income inequalities within countries and what seem to be the effective areas of action?" We focus on how the development of inequality in countries relates to the process of structural transformation of their economies, i.e. to what extent is inequality an outcome of structural transformation of the economy from agriculture to more industrial or service based economies. According to the original Kuznets hypothesis, an economies sectoral composition is the main determinant of its level of inequality (Kuznets, 1955). However, so far, empirical support for this theory is limited.

Based on a newly developed sectoral database which includes information on persons employed and share in GDP for 10 sectors in the economy (Timmer, de Vries and de Vries, 2015) for a subset of African countries we analysed the complex relationship between inequality – structural transformation and (inclusive) growth.

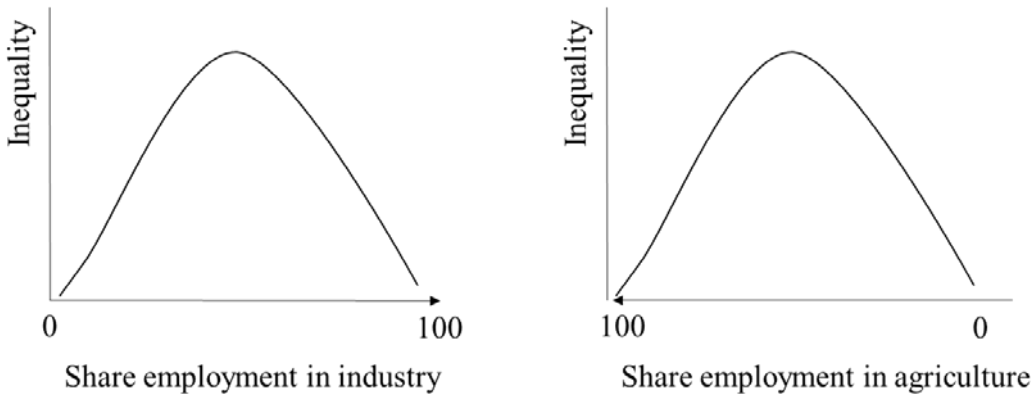
Key findings:

1. A decreasing share of employment in agriculture in Africa lowers average income inequality
2. Increasing employment in industry decreases average income inequality in Africa
3. Increasing employment in services does not significantly affect average income inequality in Africa.

Economic Development and structural transformation

Economic development has the potential to reshuffle a nation's income distribution, as development does not start in every part of the economy at the same time (Lewis, 1983). This insight is by no means novel. In fact, many scholars have explicitly discussed the relationship between inequality and growth. Most famously, Kuznets (1955) put forward his 'inverted U hypothesis' that inequality first rises and later declines with growing per capita income. The chief explanation of both the upward and the downward sloping segment of the inverted-U curve are the relative changes in a nation's sectoral employment (see figure 1). Kuznets (1955) holds that income inequality is affected by the reallocation of workers from agricultural sectors to non-agricultural sectors: as an economy develops, workers move from the traditional agricultural sector to the more advanced/urban sectors looking for better-paying jobs. This increases inequality due to an increase of inequality in incomes between the agricultural sector and modern sectors (between sector inequality). Moreover, the variance of incomes in the modern sector is large due to skill premiums (within sector inequality). As development continues, inequality is expected to decline again as more and more people are incorporated into the modern sectors. The influence of between sector inequality decreases as only a limited number of people are still working in the agricultural sector, and as more people are supplying labor in the modern sectors, skill premiums decrease and within sector inequality will be lower. The theory expects between sector migration will continue until the labor surplus in the agricultural sector is depleted (Lewis, 1954; Kuznets, 1955).

Figure 1: Kuznets inverted U shape, for into industry and out of agriculture



Literature

Many studies have been devoted to testing the Kuznets Hypothesis, and evidence on the existence of the Kuznets curve is mixed. Early cross sectional data for a global set of countries seemed to be consistent with the Kuznets hypothesis: income inequality was highest in growing and transitioning economies in Latin America, and lower in poor agricultural based economies in Africa and in wealthy modern economies in Europe (Todaro and Smith 2009). Moreover, sparse historical data on income inequality in European economic development also seems to support the notion that income inequality has declined since industrial development in the 19th century (Lindert 1986). But over time, as data quality and coverage improved, evidence became more mixed. Most studies still found support for the Kuznets hypothesis (among others Ahluwalia (1976a, 1976b), Campano and Salvatore (1988), Bourguignon and Morrison (1990), Anand and Kanbur (1993), Bourguignon (1994), Ram (1995), Lin et. al (2006), and Huang and Lin (2007) and Barro (2008). But increasingly scholars failed to find evidence for the Kuznets curve, especially when controlling for country fixed effects (Deininger and Squire, 1998; Higgins and Williamson, 2002; Savvidesa and Stengos, 2000). In addition, several studies argue that the decline in income and wealth

inequality in many developed countries during the first half of the twentieth century cannot be explained by the Kuznets Hypothesis. Piketty and Saez (2003) and Piketty et al. (2006), for instance, claim that changes in income inequality in the last century in the United States and France are mainly due to accidental phenomenon, including changes in labor market institutions, fiscal policy and social norms with respect to pay inequality, rather than (only) due to a Kuznets-type process, according to which income inequality would have declined spontaneously as an increasing amount of workers joined more advanced high-paying sectors of the economy.

The above-mentioned reservations regarding a Kuznets' like explanation of changes in income inequality do not imply that Kuznets' hypothesis has become irrelevant, though, as there are simply not enough studies available to draw definitive conclusions. This especially holds for Sub-Saharan Africa, for which a lack of high quality historical data has seriously hampered empirical research on the relevance of the Kuznets hypothesis. Moreover, the majority of the studies analysed the two 'ends' of the Kuznets hypothesis, i.e. the relationship between inequality and income. Very few studies looked at the 'Kuznets process', that is to the relationship between inequality and structural transformation of the economy which serves as an explanatory channel of the growth-inequality relationship. By using a newly developed sectoral database for Africa, including information on persons employed and share in GDP for the major sectors in the economy, we hope to shed new light on the relevance of the Kuznets hypothesis for explaining income inequality of a group of Sub-Saharan African economies.

Structural transformation as a driver of inequality

In this study we explicitly look at the effects of changes in the sectoral composition of employment on income inequality. There are various ways in which changes in where people work might affect income inequality.

1. *Out of agriculture.* That is, the potentially differential effects of a transition to manufacturing or services received no attention. We know this difference in the sequencing of the structural transformation is very relevant for especially Africa where labor has primarily been moving from agriculture to services. In the meantime, industrialization so far has been modest or even absent (McMillan and Rodrik, 2014).
   We relate the share of employment in agriculture on inequality while controlling for the total years of schooling, total volume of trade volume and financial liberalization[1]. We expect that a higher the share of employment in agriculture is associated with lower levels of inequality, in line with the Kuznets hypothesis.

2. *Into industry and services and trickle down of manufacturing*. In the next step we explore the inequality consequences of the employment shares of the two non-agricultural sectors: industry (which includes manufacturing as a sub-component) and services in order to explore the potentially differential effects of a transition to manufacturing or services. This seems an important distinction especially for Africa (McMillan and Rodrik, 2014). Relevant here is also to analyse whether the within sector inequality in manufacturing decreases as the employment share in industry increases as Kuznets (1955) hypothesises (the trickle-down effect (Tribble, 1999).

[1] For the full model and explanation of all control variables, see appendix (to be done)

3. *Urbanisation*. We analyse the relationship between urbanisation and inequality because in earlier literature, urbanisation and industrialisation are used interchangeably (Kuznets, 1955). This might be due to the fact that urbanization and industrialization were moving in tandem during the period Kuznets (1955) considered, namely the early stages of industrialization in the UK. However, Galbraith & Kum (2005) show that while the employment share of manufacturing in total employment leads to more equality[2] (confirming the notion of trickle down), urbanization promotes inequality. This finding may be explained by the tendency of urban centers to encompass more diverse and complex economic activities relative to the agriculture-dominated rural areas, but also relative to the manufacturing sector. So potentially, urban dwellers can become very wealthy, such that urbanization is expected to increase inequality.

In an appendix we also include some first analyses of the effects of structural transformation on inclusive growth, measured as broad based welfare (Jones and Klenow, 2016). We only have this welfare measure for 2007, hence a more thorough analysis will be performed when time series data is available.

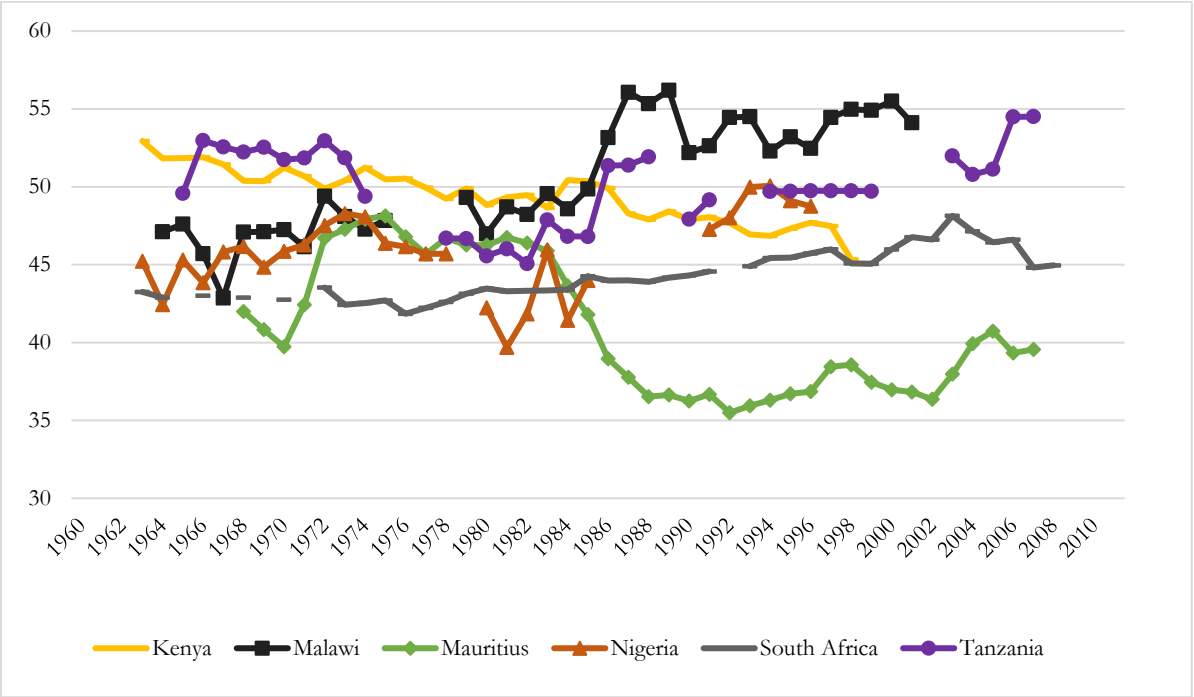
Data

Inequality

[2] The focus of the study by Galbraith and Kum (2005) is the creation of a comprehensive inequality dataset (which, in fact, will be used in this research) and not on reasoning much on the mentioned regression.

For economy-wide inequality we use a measure for household income inequality from the University of Texas Inequality Project (Galbraith & Kum, 2005).[3]

Figure 2: Inequality for selected countries 1960-2011



Source: Galbraith and Kum (2005). For graph including all countries see appendix.

Mauritius and Kenya are the only African countries included in our sample for which inequality declined during the second half of the twentieth century. Kenya experienced a steady albeit slow decline in income inequality throughout the period. Income inequality in Mauritius fluctuated substantially, with inequality first increasing between the mid-1960s to

[3] This inequality estimates is an adjusted version of the once-widely-used dataset of Deininger & Squire (1996), which has played an important role in inequality research also has been subject to a widely recognized critique by Atkinson & Brandolini (2001). Their critique is mainly directed at the fact that Deininger & Squire (1996) combine various 'types' of inequality and income – e.g. expenditure- & income-inequality; gross- & net-income; and household- & individual-income – to a single inequality measure. Atkinson & Brandolini (2001) show that the resulting observations are flawed by the heterogeneity of the different underlying methodologies used. Galbraith & Kum (2005) pick-up on the critique by Atkinson & Brandolini (2001) and transform the dataset of Deininger & Squire (1996) by using estimates that account for the heterogeneity of the underlying data. Observations for which the underlying data source is of doubtful validity are removed. As a result, the dataset of Galbraith & Kum (2005) excludes some steep and sudden drops in inequality levels that were present in Deininger & Squire (1996). In case no major event (e.g. social unrest) occurred that served as an explanation, these drops in the dataset of Deininger & Squire (1996) were of dubious validity and had puzzled researchers.

the early 1970s, remaining stable for a decade after which inequality rapidly declined, making Mauritius the most equal country since the 1980s. During the beginning of the 21st century, inequality in Mauritius started to rise again, although the trend seems to stabilize again at still low levels from an African perspective. Inequality levels between the countries in the sample converged during the 1970s, but as all countries except Mauritius and Kenya saw their income inequality increase, inequality levels diverged substantially after 1980. South Africa experienced a steady increase in inequality throughout the period, while in Tanzania the inequality trend followed a U-shape pattern, starting off very high and dropping until the early 1980s after which it increased again to make Tanzania the most unequal country in the sample.

Sectoral employment

Sectoral employment is obtained from the 10-sector database from the Groningen Growth and Development Centre (Timmer, de Vries, & de Vries, 2015). This database provides information on the number of persons engaged in employment for 10 broad sectors in the economy. The GGDC 10-sector dataset is constructed from national surveys that are harmonized to accord to international standards. Gross value-added and constant prices follow the UN System of National Accounts definitions. Employment includes paid employees, self-employed as well as family workers. This data is mostly based on population censuses which ensure a wide coverage of the working population. This is particularly advantageous in describing developing countries where business or labor force surveys would not cover the (abundant) presence of small firms (business surveys) or only a relatively small part of the population (labor force surveys). However, since censuses are only quinquennial or decennial, the database relies on business and labor force surveys for annual trends while the absolute level stems from census data. The use of the GGDC 10-sector database is also attractive as it

employs the International Standard Industrial Classification Rev.3 (ISIC-3) that provides a sector classification that is common across all periods and countries, thus, allowing for cross-period and -country comparison. Another advantage of the use of ISIC-3 is that the sectors are mutually exclusive.

The World Bank's Word Development Indicator (WDI) definition[4] is used when dividing economy-wide employment into the three sectors aggregates: agriculture, industry and manufacturing. Table 1 below provides the details.

Table 1: Description of three sector aggregates

Sector	Sub-Sectors	Sub-Sectors (ISIC-3)
Agriculture	Agriculture (includes hunting, forestry and fishing)	AtB
Industry	Mining, Manufacturing, Utilities and Construction	C, D, E and F
Services	Trade-, Transport-, Business, Government- and Personal-services	G+H, I, J+K, L+M+N, and O+P

Urbanization

Urbanization data is taken from the World Bank.[5] The annually-available statistic denotes the percentage of the population that lives in urban areas. The sources that underlie this dataset are the World Bank's own population estimates, which are combined with urban ratios from the United Nations World Urbanization Prospects (UNWUP) that relies on national surveys.

[4] Sources of definitions: Agriculture: http://data.worldbank.org/indicator/NV.AGR.TOTL.ZS/countries, Industry: http://data.worldbank.org/indicator/NV.IND.TOTL.ZS, Services: http://data.worldbank.org/indicator/NV.SRV.TETC.ZS

[5] Urbanization data is not available for Taiwan, for which else both structural composition and inequality observations are included.

Since national surveys are not executed annually, estimations are used to fill in the gaps, which leave rather smooth trends.

One could argue that using urban employment rather than urban population is preferred since the sectoral shares are also expressed in terms of employment. Yet, the ILO has only recently started to collect data on urban employment so for most countries urban population is only available since 1993. Given that for the full sample of countries, the correlation between urban population and urban employment 0.77 is for the period 1960-2014, we feel that urban population is a reasonable proxy for urban employment, and hence use urban population in our estimations[6].

Conditioning Factors and Controls

There are obviously many other factors which condition the influence of structural change on inequality or have a direct effect on income inequality. Based on a broad reading of the literature, we control for the most prominent ones. The first variable is *education*. Early human capital theory indicates that education increases income, and thus, educational expansion or increasing public expenditure on education will decrease income inequality and increase intergenerational mobility (Yang and Qui, 2016). Comparing a broad range of countries in the period 1960-1990, Gregorio & Lee (2002) find support for this notion. They report that both higher educational attainment and a more equal distribution of education reduce income inequality. However, there is also empirical evidence which shows that increased educational attainment actually increases income gaps because the rate of return to higher education is much higher than the rate of return to lower levels of education. In

[6] Since the definitions for employment of the ILO are stricter than those applied by the GGDC-10 sector database (which e.g. includes domestic workers), the actual extent to which urbanization proxies for urban employment can be expected to be even higher when urban employment is defined according to the GGDC-10 criteria. That is, GGDC-10 criteria are somewhat 'in the middle' of population and strict employment measures.

addition, when more and more people acquire higher education, the rate of return on higher education still remains at a comparatively high position; in other words, educational expansion might not reduce income inequality (Mincer, 1974). Our measure for education is the average years of schooling amounted by the population aged 25 (Barro & Lee, 2013). This measure is devised to include all levels of education (primary, secondary and tertiary education).

The second factor we include is a nation's *political system.* The political system is crucial in managing income inequality, also in relation to structural change as has been shown by Acemoglu & Robinson (2002). General theory predicts that democracy leads to a more equal distribution of income not only because of more redistribution[7], but also by means of higher representation of the poor that leads to improved social policy and also strengthens trade unions. Empirical evidence on the effects of democracy on income inequality is, however, mixed. See Reuveny & Li (2003) for a literature review. The presence of undemocratic, yet, income-equality oriented systems – mainly one-party communist – may explain why in a cross-country comparison democracy does not unambiguously improve the income distribution. Instead of considering democracy or communism/socialism, the present research therefore uses and indicator for non-communist/socialist authoritarian regimes, i.e. dictatorships. Dictatorships can neither be expected to allow for adequate representation (as in democracies), nor can they be expected to engage in excessive redistributive policies (as in democracies and communist regimes). The political system is captured by a dummy which equals 1 when the country is classified as either a dictatorship or a military dictatorship according in the University of Texas Political Regime Dataset in the respective year.

The third factor taken into account is *openness to trade*. Increasing a nation's economic openness will leave some of its citizens better off, while others might lose (Ohlin, 1952).

[7] See Alesina & Rodrik (1994) for an economic model that explores the democracy-redistribution relationship

Relative to developing countries, developed countries are abundant in skilled labor and will, thus, specialize in the production of skill-intensive commodities, while relying on imports to procure labor-intensive manufactures and primary products. This, in turn, increases the demand for unskilled labor in developing countries where it is relatively cheap, while, at the same time, demand for skilled labor decreases. According to Stolper & Samuelson (1941), at this point the wages of unskilled workers producing traded goods in the low-skill country tend to rise as international trade increases. This, in turn, compresses the income distribution in the less developed country. For the more developed country, the implications are opposite. The degree of openness to trade is expressed by the sum of the shares of imports and exports in GDP. The statistics (at current PPP) are obtained from version 8 of the Penn World Tables (Feenstra, Inklaar & Timmer, 2015).

Finally, we take account of *financial liberalization*, because it is another aspect of economic openness that carries consequences for the income distribution. In a recent study, Bumann and Lensink (2016) find that for financially developed countries, financial liberalization decreases inequality. Financial liberalization is captured by the capital account openness index from Chinn and Ito (2006) that is also used in Bumann and Lensink (2016). The components of this index are: (I) the presence of multiple exchange rates, restrictions on (II) current and (III) capital accounts and transactions and (IV) an indicator on the requirements to surrender exports proceeds. Since higher values indicate that the country's capital account is more open, all components contribute inversely to the index.

Structural transformation: out of agriculture

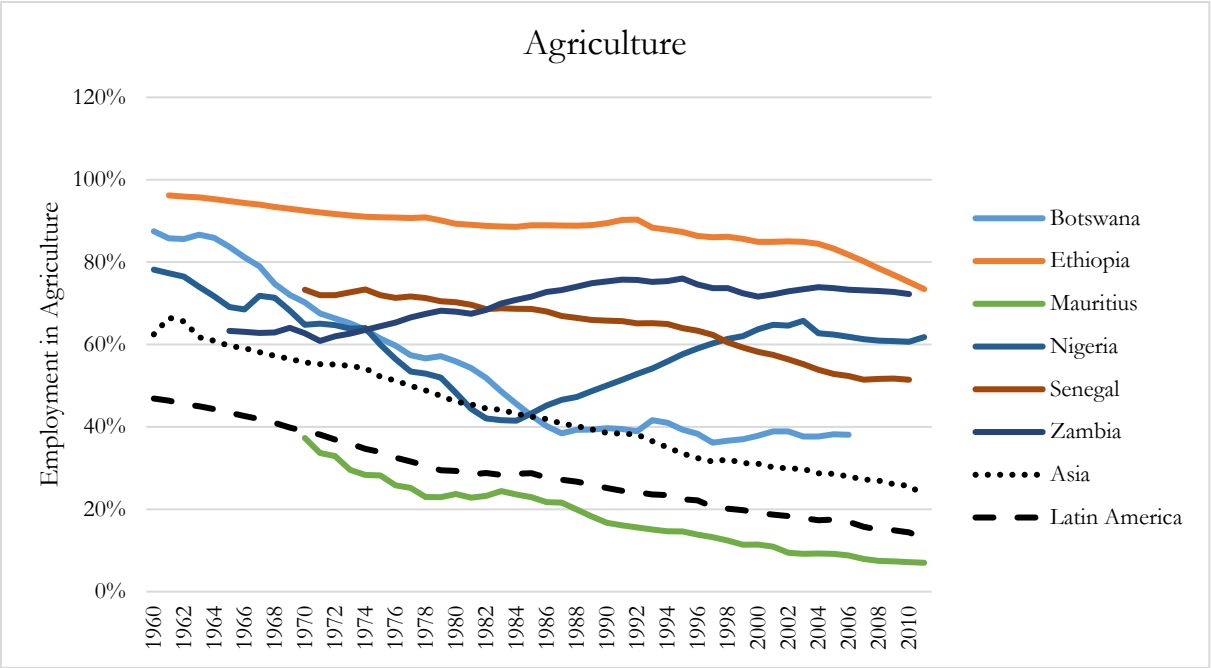
In the pre-industrial phase of economic development, most people, if not all, are engaged in (subsistence) agriculture. When an economy starts to develop, workers typically move out of

the traditional agricultural sector into other, more advanced/urban sectors of the economy in search for better-paying employment. So the process of structural transformation always starts with an 'out of agriculture' movement.

When we look at the past 50 years, this is exactly what the developing world has experienced, namely, a substantial decline in employment in agriculture. At the same time, there has been considerable diversity in employment developments, especially between African countries. On the one hand, Mauritius and Botswana, often characterized as the growth miracles of Africa (Rodrik, 2004), followed a typical out of agriculture development path similar to Asian and Latin American countries. On the other hand, some African countries actually experience an increase in people working in agriculture, such as Nigeria and Zambia. The initial rapid decline in employment in agriculture in Nigeria can be explained by the increasing importance of the oil industry within the Nigerian economy (Ogbalubi and Wokocha, 2013). As a consequence, Nigeria became a major importer of agricultural products. After the introduction of the Green Revolution Programme, started in Nigeria 1980, employment in agriculture started to increase again. Yet, today, the bulk of farmers are engaged in agricultural production at subsistence level (Ogbalubi and Wokocha, 2013). For Zambia, a period of economic decline which started in the 1970 corresponds with a steady increase in employment in agriculture. Yet, even though agriculture expanded in terms of employment, agriculture output registered virtually zero growth over the period and its contribution to GDP was negligible (Harasty et al. 2015; Mujenja and Wonani, 2012).

At the same time, in countries like Ethiopia (and Tanzania, Malawi, see appendix graph) very few people found employment outside agriculture until very recently, and employment remained very high during most of the 20th century (see Figure 3).

Figure 3: Employment in Agriculture for selected countries



Source: African sector database (Timmer et. al, 2015). For a graph including all countries, see appendix.

To see the effects of people finding employment in other sectors than agriculture on economy wide income inequality we allow for a non- linear relationship between employments shares in agriculture and inequality. That is, we would like to see whether the share of employment in agriculture affects inequality directly, but also whether that effect of people moving out of agriculture changes depends on the size of the agricultural sector (in terms of employment). This non-linearity is exactly in line with what Kuznets argued: when most people are employed in agriculture, the reallocation of labor from agriculture to other more productive sectors is expected increase inequality. Over time, when the size of the agricultural sector has become small, additional reallocation of people towards other sectors is actually expected to decrease inequality.

TABLE 1: Economy wide inequality and labor share in agriculture

VARIABLES	(1) Inequality	(2) Inequality	(3) Inequality	(4) Inequality	(5) Inequality
Africa share employment			0.1233	0.3706	0.5164**
agriculture			(0.457)	(0.528)	(0.048)
Africa share employment				-0.2508	
agriculture square				(0.609)	
Other regions					
EU/US share employment			-0.0338	-1.7930***	-1.2794
agriculture			(0.858)	(0.007)	(0.264)
EU/US share employment				6.2264***	6.4991*
agriculture square				(0.004)	(0.061)
Asia share employment			0.3213**	-0.1384	0.6261***
agriculture			(0.018)	(0.701)	(0.001)
Asia share employment				0.5942	
agriculture square				(0.204)	
Latin America share			-0.2511*	-0.0788	-0.0395
employment agriculture			(0.067)	(0.832)	(0.817)
Latin America share				-0.2738	
employment agriculture square				(0.642)	
Middle East North Africa share			-0.7272***	-7.3540***	-6.0366***
employment agriculture			(0.000)	(0.000)	(0.000)
Middle East North Africa share				8.1862***	7.0663***
employment agriculture				(0.000)	(0.001)
Share employment agriculture	0.0688	-0.1466			
	(0.528)	(0.495)			
Share employment agriculture		0.2885			
square		(0.291)			
Dictator					-0.0218
					(0.257)
Trade openness					-0.0698***
					(0.010)
Education					0.0197**
					(0.018)
Financial Liberalization					-0.0001
					(0.983)
Constant	3.7105***	3.7302***	3.7156***	3.8028***	3.6233***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	293	293	293	293	252
Number of countries	39	39	39	39	36
Adjusted R-squared	0.005	0.019	0.138	0.231	0.329

Robust pval in parentheses: *** p<0.01, ** p<0.05, * p<0.1. The estimates contain country fixed effects. Standard errors are clustered at the country level. We also conducted pooled OLS and random effects regressions. However, as the Hausman test indicated the existence of fixed effects, we only present the (country) fixed effects regressions. This holds for all tables in the main text.

Table 1 presents regression results on the relationship between the labor share in agriculture and inequality. The regressions are based on country-fixed effects estimates. The sample includes a broad set of countries, including developed economies (Western Europa and US) and countries form a variety of developing countries regions, including Sub-Saharan Africa. In columns (1) and (2) it is assumed that the relationship between labor share in agriculture and inequality is the same for all countries in the sample. Column (1) assumes a linear relationship, while column (2) allows for a non-linear relationship by including a quadratic term for the labor share in Agriculture. Columns (3), (4), and (5) test whether there are differences for the various country groups. Column (5) is the preferred regression, in which also a set of control variables is taken into account.

We find no evidence for a Kuznets inverse-U shape curve in Africa, nor for other world regions, as the linear and quadratic terms are either insignificant or have the "wrong" sign. In fact, we find that increasing employment shares in agriculture in both African and Asia are actually associated with increasing income inequality. Additionally, we find two 'opposite' Kuznets curve, namely for the West (Europe and United States) and the Middle East and North Africa (MENA): for low levels of employment in agriculture, increasing agricultural employment leads to lower inequality. For high labor shares in agriculture, increasing agricultural employment starts to increase inequality (model 3 and 4).

The only two control variables which are significantly associated with inequality are education and openness to trade. We find that more trade is associated with lower income inequality, in line with what theory predicts (Stolper & Samuelson, 1941). For education we find that higher levels of education level are positively related to income inequality. As explained above, this could be due to increased income gaps because the rate of return to higher education is much higher compared to the rate of return to lower levels of education (Mincer, 1974).

Into industry and services and trickle down of manufacturing

When people seek employment outside of agriculture, in the Kuznets framework they all first go to industry/manufacturing. However, in the African context we know that so far very little industrial/manufacturing activity has been developed, and that most people actually moved into services (McMillan and Rodrik, 2014; De Vries et al., 2015). This is something that becomes clear from graphs 2 and 3 below. Mauritius, and to some extent South Africa, are the only African countries included that has followed a 'standard' pattern of structural transformation from agriculture to industry to services. In Mauritius employment in industry expanded rapidly until around1990, at the expense of agriculture. After 1990, people moved out of industry again, and into services. In South Africa a smaller share of the work force was employed in industry, but the pattern of labor reallocation is similar to Mauritius, except that employees in South Africa started to move towards services already from the early 1980s onwards. Ghana is the only other country were some industrial activity developed. In all other African countries, industry remains at a very low level of development, although it started to increase in Kenya, and Senegal after the 1990s and recently also in Ethiopia.

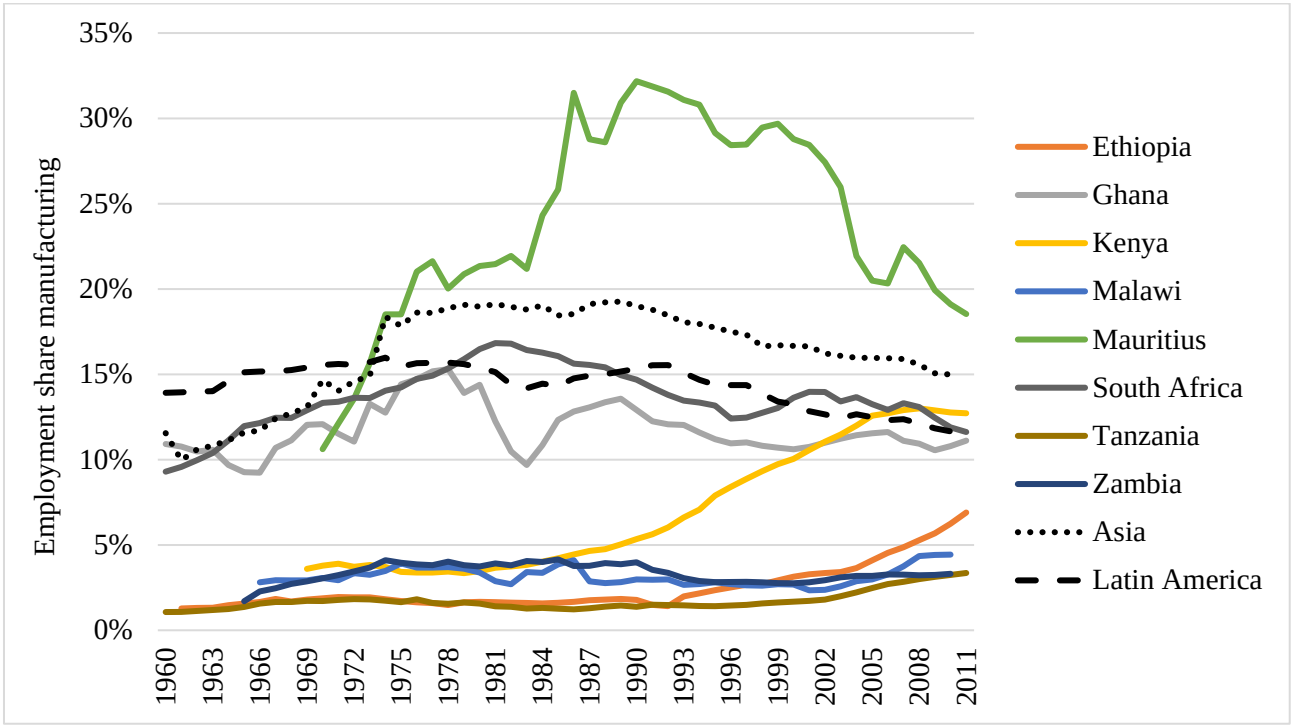
Putting African trends in a comparative perspective, it is clear that most African countries lag behind both Latin America and especially Asia. The industrial/manufacturing sector developed much earlier and employed much more people on average in both regions compared to Africa, with the exception of Mauritius and South Africa. In terms of manufacturing trends, Mauritius showed much more similarities with Asia than with fellow African countries.

The service sectors show a more dynamic pattern. In all countries employment in services (both formal and informal) expanded substantially over the past 40 year, although there is

again marked diversity between African countries. Workers mainly found employment in market services industries, such as retail trade and distribution. Though such services have higher productivity than much of agriculture, they are not technologically dynamic and are in terms of productivity levels falling behind the world frontier (Timmer et al. 2015).

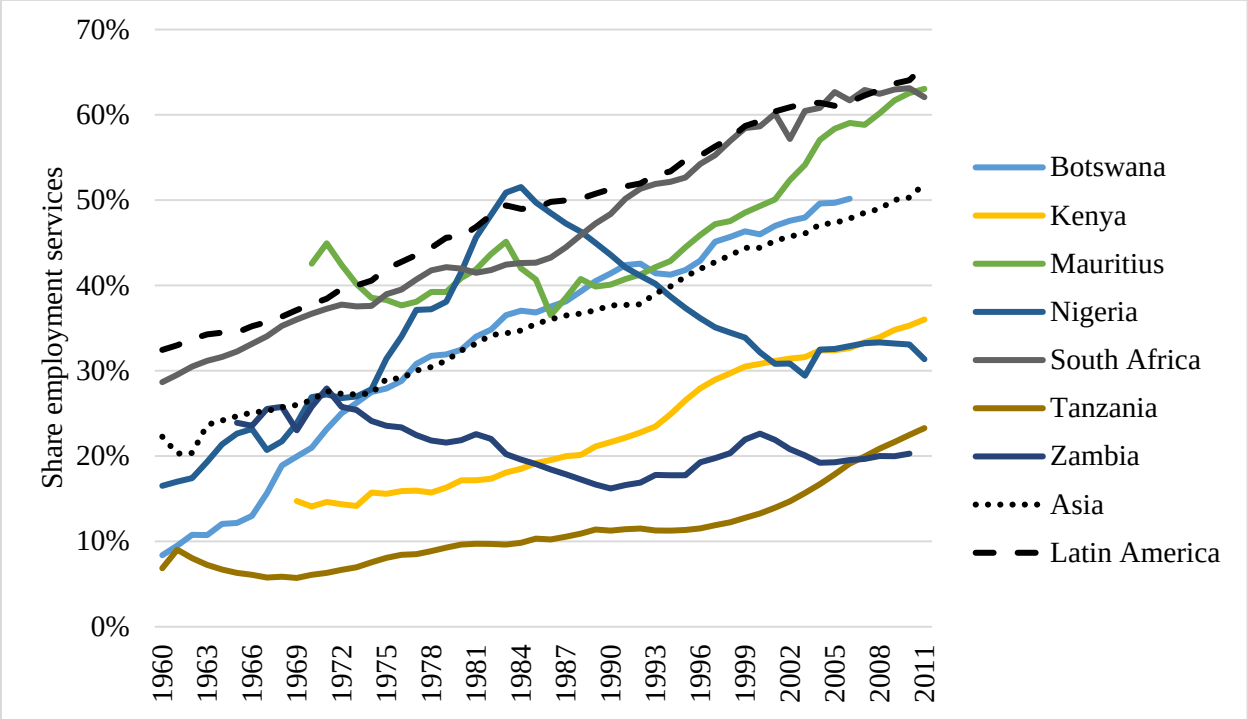
The largest service sectors in terms of employment can be found in South Africa, Mauritius and Botswana. The level of employment in services in Senegal, Kenya and Ghana recently converged to around 35%; the rest of the countries have a much lower share of employment in the tertiary sector. The only exception to the increasing share in service employment is Nigeria. The employment trend in services in fact mirrors the employment trend in agriculture, where services first show a rapid increase, followed by a strong decline of employment.

Figure 4: share of employment in manufacturing, selected countries



Source: African sector database (Timmer et al., 2015). For a graph including all countries, see appendix

Figure 5: share of employment in services, selected countries



Source: African sector database (Timmer et al., 2015)

As people move into more productive, more modern sectors, inequality is expected to go up at first as the first movers earn more than the people in the traditional sector, and also because wage differentials are at least initially, larger in the modern sectors (Kuznets, 1955). Over time, as more people found employment in the modern sectors, inequality is expected to fall again. Exploring this relationship first for the move into industry (see table 2 below), we find that for Africa, and most other regions as well, increasing industrial employment leads to lower inequality. Additionally, and in line with the results in the previous section, we find no evidence for a non-linear relationship (model 1- model 5). Only for Latin America do we find a Kuznets curve: an increase in labor shares in industry first increases inequality; for high labor shares in industry, a further increase in labor shares in industry will reduce inequality.

TABLE 2: Economy wide inequality and labor share in industry

VARIABLES	(1) Inequality	(2) Inequality	(3) Inequality	(4) Inequality	(5) Inequality
Africa share employment industry			-0.7355***	-0.3178	-0.7560***
			(0.000)	(0.651)	(0.000)
Africa share employment industry square				-0.8833	
				(0.461)	
Other regions					
EU/US share employment industry			-0.7368***	-1.1174	-0.9350***
			(0.000)	(0.109)	(0.000)
EU/US share employment industry square				0.6165	
				(0.654)	
Asia share employment industry			-1.0610***	-1.2681	-1.2170***
			(0.000)	(0.252)	(0.001)
Asia share employment industry square				0.4491	
				(0.826)	
Latin America share employment industry			-0.9702***	3.3281***	3.6029***
			(0.009)	(0.003)	(0.001)
Latin America share employment industry square				-9.0106***	-9.9482***
				(0.001)	(0.000)
Middle East North Africa share employment industry			2.7728***	-19.8286	2.7830***
			(0.000)	(0.514)	(0.000)
Middle East North Africa share employment industry square				54.7353	
				(0.463)	
Employment share industry	-0.8002***	-0.8035			
	(0.000)	(0.186)			
Employment share industry square		0.0062			
		(0.995)			
Dictator					-0.0082
					(0.673)
Trade openness					-0.0844***
					(0.000)
Financial liberalization					-0.0079
					(0.168)
Education					0.0082*
					(0.084)
Constant	3.9139***	3.9143***	3.8853***	3.9287***	3.8056***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	293	293	293	293	252
Number of countries	39	39	39	39	36
Adjusted R-squared	0.308	0.306	0.375	0.384	0.476

Robust pval in parentheses: *** p<0.01, ** p<0.05, * p<0.1. The estimates refer to country

fixed effects estimates. Standard errors are clustered at the country level.

When we look at the effects of an expanding service sector on inequality, we find that for Africa, Latin America and Europe/US, higher labor shares in services lead to an increase in inequality, while the effect is non-significant for Africa (see Table 3). Additionally, for three regions there is evidence for a non-linear relationship: higher labor shares in industry first leads to decrease in income inequality; for high labor shares a further increase leads to an increase in inequality.

It is interesting to note that the impact of higher labor shares in industry seems to lower inequality, while higher labor shares in services seems to increase inequality in most regions. However, for Africa the impact of higher labor shares in services on inequality is insignificant. More research is needed to quantify possible future consequences for Africa of the current movements from people out of agriculture into services.

Again, the only two control variables which are significantly associated with inequality are education and openness to trade, see above.

TABLE 3: Economy wide inequality and labor share in services

VARIABLES	(1) Inequality	(2) Inequality	(3) Inequality	(4) Inequality	(5) Inequality
Africa share employment			0.0171	-0.0513	0.1458
services			(0.915)	(0.925)	(0.535)
Africa share employment				0.0906	
services square				(0.899)	
Other regions					
EU/US share employment			0.3113*	-2.6958***	-2.9008***
services			(0.093)	(0.000)	(0.000)
EU/US share employment				2.5276***	2.9795***
services square				(0.000)	(0.000)
Asia share employment services			-0.2601	-2.2465***	-2.2234***
			(0.281)	(0.009)	(0.006)
Asia share employment services				2.2706**	2.5998***
square				(0.019)	(0.007)
Latin America share			0.3554***	0.3919	0.6993***
employment services			(0.005)	(0.584)	(0.000)
Latin America share				-0.0378	
employment services square				(0.954)	
Middle East North Africa share			0.9129***	-7.2685***	-7.5907***
employment services			(0.006)	(0.000)	(0.000)
Middle East North Africa share				10.6799***	11.4468***
employment services square				(0.000)	(0.000)
Share employment services	0.1585	-0.8994**			
	(0.160)	(0.040)			
Share employment services		1.0766***			
square		(0.009)			
Dictator					-0.0125
					(0.528)
Trade openness					-0.1007***
					(0.000)
Education					-0.0081
					(0.191)
Financial liberalization					-0.0050
					(0.295)
Constant	3.6629***	3.8841***	3.6562***	4.0534***	4.0850***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	293	293	293	293	252
Number of countries	39	39	39	39	36
Adjusted R-squared	0.039	0.158	0.163	0.357	0.499

Robust pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1 The estimates refer to country fixed effects estimates. Standard errors are clustered at the country level.

Trickle-down

It is unrealistic to assume that intra-sector inequality remains constant over time. In fact, Kuznets (1955) already argued that within sector inequality in manufacturing decreases as the employment share in industry increases. This is called the trickle-down effect. For trickle-down to decrease overall income inequality, its effect needs to dominate the inequality promoting effect that the industrial sector has on economy wide inequality due to its higher within-sector inequality relative to the agricultural sector.

The average for all countries combined suggests that increasing employment shares in manufacturing indeed lowers inequality in manufacturing pay (table 4, model 1 below). Yet, when we disaggregate between regions, we only find the trickle-down effect for Latin America. For Africa we find no significant trickle-down effect. However, it is interesting to note is that it is the only region in the world where an increase in share of employment in agriculture actually correlates with an increase in inequality in pay – but only without controlling for other variables of interest (model 2). When controlling for other factors, indeed the relationship turns negative, yet still insignificant.

TABLE 4: Impact of Shares in Manufacturing on Inequality in manufacturing wages

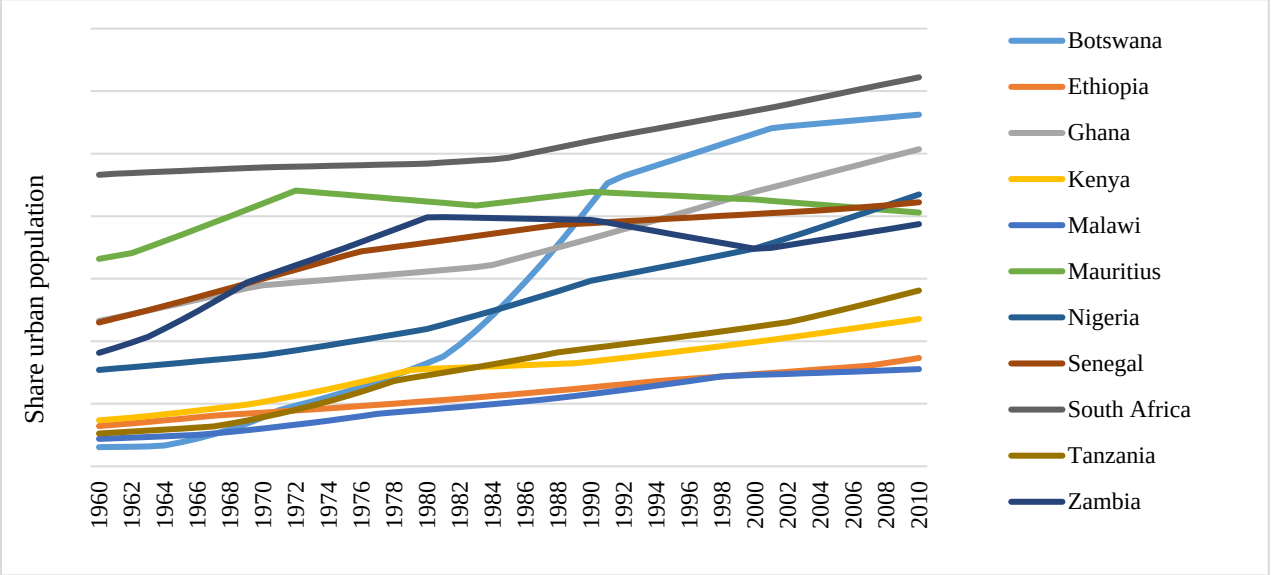
VARIABLES	(1) Inequality pay manufacturing	(2) Inequality pay manufacturing	(3) Inequality pay manufacturing	(4) Inequality pay manufacturing
Africa share employment manufacturing			0.7331	-0.2231
			(0.651)	(0.927)
Other regions				
EU/US share employment manufacturing			-0.7601	-0.4884
			(0.298)	(0.746)
Asia share employment manufacturing			-3.8378	-4.8163
			(0.155)	(0.166)
Latin America share employment manufacturing			-8.4970**	-9.8777***
			(0.034)	(0.003)
Middle East North Africa share employment manufacturing			-3.6881	-15.6574
			(0.723)	(0.170)
Share employment manufacturing	-1.9414*	-7.3210		
	(0.056)	(0.109)		
Share employment manufacturing square		13.8492		
		(0.175)		
Dictator				0.0350
				(0.842)
Trade openness				-0.5909***
				(0.001)
Financial liberalization				-0.0088
				(0.859)
Education				0.0921**
				(0.026)
Constant	-3.1494***	-2.7426***	-3.0030***	-3.0182***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	300	300	300	253
R-squared		0.040	0.068	0.233
Number of country's	39	39	39	36
Adjusted R-squared	0.022			

Robust pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The estimates refer to country fixed effects estimates. Standard errors are clustered at the country level.

Urbanisation.

We analyse the relationship between urbanisation and inequality because in earlier literature, urbanisation and industrialisation are used interchangeably (Kuznets, 1955). Indeed, Gollin et al. (2016) found in a sample of developing countries that for non-natural resource exporting countries, that industrialization and urbanization develop in tandem. For natural resource dependent countries however, urbanization and industrialization do develop simultaneously, as urbanization, increases during the years of increasing exports, while industrialization does not follow suit. In a recent study in Botswana, Hillbom and Bolt (2015) indeed argue that urbanization in this resource dependent, sparsely populated country, in itself could be a driver of inequality without immediate links to industrialization. In a similar vein, Galbraith and Kum (2005) show that also in a global set of countries, urbanization is associated with increasing inequality. Galbraith and Kum (2005) explain this finding by pointing at the more diverse and complex economic activities taking place in urban centers relative to the agriculture-dominated rural areas, but also relative to the manufacturing sector. So potentially, urban dwellers can become very wealthy, such that urbanization is expected to increase inequality. Figure 6 presents trends in urbanization for the African countries in our dataset.

Figure 6: Trends in Urbanization



Source: World Bank (2016)

Looking at the connection between urbanisation and inequality, we find no evidence for a non-linear relationship between urbanisation and inequality (see Table 5). So the effects of increasing urbanisation do not seem to change with the level of urbanisation, i.e, there does not seem to be a trickle-down effect of urbanisation on inequality, where when most people live in cities, inequality will decrease. Income differences between citizens in cities remains simply too large.

In Africa and other regions except Asia, urbanisation seems to drive up inequality (although results for Africa are non-significant). However, when we control for relevant factors, rising urbanisation in Africa is negatively associated with inequality (again non-significant, though). For other continents the relationship remains positive. The clear outlier here is Asia, where rising urbanisation is strongly associated with lower inequality (model 1 and 3).

TABLE 5: Urbanization

VARIABLES	(1) Inequality	(2) Inequality	(3) Inequality	(4) Inequality	(5) Inequality
Africa share urban population			0.1587	-0.1073	-0.2232
			(0.214)	(0.837)	(0.312)
Africa urban population square				0.4286	
				(0.560)	
Other regions					
EU/US share urban population			0.4577*	-3.9096	0.5812*
			(0.087)	(0.345)	(0.051)
EU/US urban population square				3.0248	
				(0.280)	
Asia share urban population			-0.2859***	-1.0238	-0.4089***
			(0.009)	(0.126)	(0.000)
Asia urban population square				0.7307	
				(0.249)	
Latin America share urban population			0.3175**	-0.5141	0.2870
			(0.037)	(0.525)	(0.152)
Latin America urban population square				0.6768	
				(0.240)	
Middle East North Africa share urban population			0.0643	-3.5309	-0.1986
			(0.180)	(0.325)	(0.186)
Middle East North Africa urban population square				3.8818	
				(0.306)	
Share urban population	0.0102	-0.4868*			
	(0.928)	(0.081)			
Share urban population square		0.4938*			
		(0.076)			
Dictator					0.0100
					(0.676)
Trade openness					-0.1004***
					(0.000)
Education					0.0132*
					(0.075)
Financial liberalization					0.0024
					(0.722)
Constant	3.7296***	3.8225***	3.6293***	4.1514***	3.6366***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	297	297	297	297	253
Number of countries	39	39	39	39	36
Adjusted R-squared	-0.003	0.029	0.089	0.115	0.199

Robust pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The estimates refer to country fixed effects estimates. Standard errors are clustered at the country level.

Conclusions

This study aims to provide new evidence on the relevance of Kuznets' hypothesis for explaining differences in income inequality in a group of African economies. There is a shortage of empirical studies testing the Kuznets process for African countries. Moreover, existing studies focused on the relationship between inequality and income, and hence did not consider the 'Kuznets process.' Our study is the first attempt to probe the relevance of Kuznets' hypothesis for a set of African countries by directly focusing on the relationship between inequality and structural transformation of the economy, using a newly developed sectoral database for Africa.

Our analysis does not provide evidence for the inverse-U-shaped pattern of inequality for Africa as suggested by Kuznets (1955). Rather our study finds that a decreasing share of employment in agriculture and an increasing share of employment in industry in Africa leads to a monotonically declining inequality. For several regions we find that an increase in employment in services leads to a significant increase in inequality. For Africa, the impact of increasing employment in services on inequality seems insignificant, though. However, given the current developments in many African countries of people leaving agriculture to find employment in services rather than in industry, we emphasize the relevance of more research, for a broader set of African countries, to better quantify the impacts of increasing labor shares in services.

Our study also points at significant differences between regions. While the inverse-U-shaped pattern of inequality does not seem to hold for Africa, results for Latin America provide weak evidence consistent with the Kuznets process. Moreover, for the developed economies (Europe and United States) and the Middle East and North Africa (MENA) the data suggest a U-shaped pattern of inequality.

Does our analysis imply that Kuznets's hypothesis is not relevant anymore? We certainly do not believe that this is the case. It should be noticed that our period of analysis may simply be too short to fully pick up the rise and fall of income inequality associated with industrialization during the development process. In other words, had we been able to conduct the analysis for a much longer period, may be even going back to the 19th century, our results might have been supportive of the Kuznets' process. Unfortunately, historical sectoral employment data are not available, certainly not for African countries. Moreover, even for the more recent period, the available data needed to rigorously test drivers of inequality is limited, as Gini coefficients, as well as sectoral employment data, are only available for a limited group of countries.

Our main result for Africa - a monotonically declining inequality associated with an increase in labor shares in industry- may even be in line with the Kuznets' process if the development process of the African countries in our data already passed the peak of Kuznets' inverted –U shape curve, and hence corresponds to the right-hand side of the Kuznets curve. Yet, we stress that much more data and much more empirical analyses are needed before definitive judgments can be made. We hope that our study helps to draw (renewed) attention to the importance of studying patterns of income inequality in general, and African economies in particular.

Appendix I: Structural transformation and inclusive growth

Welfare

Finally, and very preliminary, we have analysed the effects of structural transformation on inclusive growth, measured as broad based welfare (taken from Jones and Klenow, 2016). It is important to know whether people are better off once they move out of agriculture, and whether the welfare effect is different when they start working in industry or in services?

While income inequality certainly is an important negative contributor to economy-wide welfare, the fact that income does not capture important other constituents of welfare (e.g. mortality) implies that also income inequality does not sufficiently proxy for welfare. The provision of certain public services (e.g. publicly provided health care) or the amount of leisure simply do not enter income and, thus, also not income inequality. Jones & Klenow (2016) devise such a welfare measure for which higher values indicate more welfare. It consists of 5 composites. Consumption (+), leisure (+), mortality (-) and, income inequality (-). The sign with which they contribute to the aggregate measure is provided in brackets.

We estimate a simple OLS regression, with welfare in 2007 taken from Jones and Klenow (2016) as the dependent variable. We find that the share in agriculture is negatively related to welfare, hence when more people are employed outside agriculture, welfare increases. Both increased employment in industry and services is weakly associated with increases in welfare in Africa, but results are not significant for changing the specification or for the inclusion of control variables.

TABLE A1: Welfare and labor share in agriculture

VARIABLES	(1) Welfare (2007) J&K	(2) Welfare (2007) J&K	(3) Welfare (2007) J&K	(4) Welfare (2007) J&K	(5) Welfare (2007) J&K
Africa share employment agriculture			-71.01***	-207.48***	-195.48***
			(0.000)	(0.000)	(0.005)
Africa share employment agriculture square				182.55***	191.86**
				(0.002)	(0.011)
Other regions					
EU/US share employment agriculture			1,024.146***	2,473.06***	1,985.65**
			(0.000)	(0.001)	(0.014)
EU/US share employment agriculture square				-42,291.97***	-33,491.93**
				(0.006)	(0.040)
Asia share employment agriculture			-90.91***	-185.66**	-186.17**
			(0.001)	(0.036)	(0.047)
Asia share employment agriculture square				167.98	211.22
				(0.294)	(0.208)
Latin America share employment agriculture			-188.65***	-400.51***	-364.97**
			(0.001)	(0.010)	(0.037)
Latin America share employment agriculture square				878.3393	808.41
				(0.156)	(0.214)
Middle East North Africa share employment agriculture			-130.46***	-253.90	134.78
			(0.004)	(0.382)	(0.654)
Middle East North Africa share employment agriculture				317.4550	
				(0.724)	
Share employment agriculture	-96.23***	-323.87***			
	(0.000)	(0.000)			
Share employment agriculture square		306.54***			
		(0.000)			
Dictator					-79.54
					(0.402)
Trade openness					-2.28
					(0.640)
Education					2.01
					(0.348)
Financial liberalization					2.41
					(0.305)
Constant	55.83***	76.05***	47.68***	54.90***	34.89
	(0.000)	(0.000)	(0.000)	(0.000)	(0.169)
Observations	37	37	37	37	35
Adjusted R-squared	0.482	0.713	0.773	0.873	0.872

pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1

TABLE A2: Welfare and labor share in industry

VARIABLES	(1) Welfare (2007) J&K	(2) Welfare (2007) J&K	(3) Welfare (2007) J&K	(4) Welfare (2007) J&K
Africa share employment industry			23.0058	-47.9449
			(0.681)	(0.345)
Other regions				
EU/US share employment industry			356.1273***	164.2502***
			(0.000)	(0.007)
Asia share employment industry			123.4960***	5.7614
			(0.006)	(0.901)
Latin America share employment industry			64.6927	-37.6169
			(0.171)	(0.419)
Middle East North Africa share employment industry			22.4221	831.4424
			(0.719)	(0.568)
Employment share industry	185.0122**	372.7410		
	(0.014)	(0.218)		
Employment share industry square		-516.0640		
		(0.519)		
Dictator				-195.3905
				(0.572)
Trade openness				5.4049
				(0.280)
Financial liberalization				2.2157
				(0.385)
Education				5.5204***
				(0.001)
Constant	-7.2410	-21.3734	1.6836	-22.7644*
	(0.638)	(0.427)	(0.842)	(0.053)
Observations	37	37	37	35
Adjusted R-squared	0.135	0.121	0.758	0.848

pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1

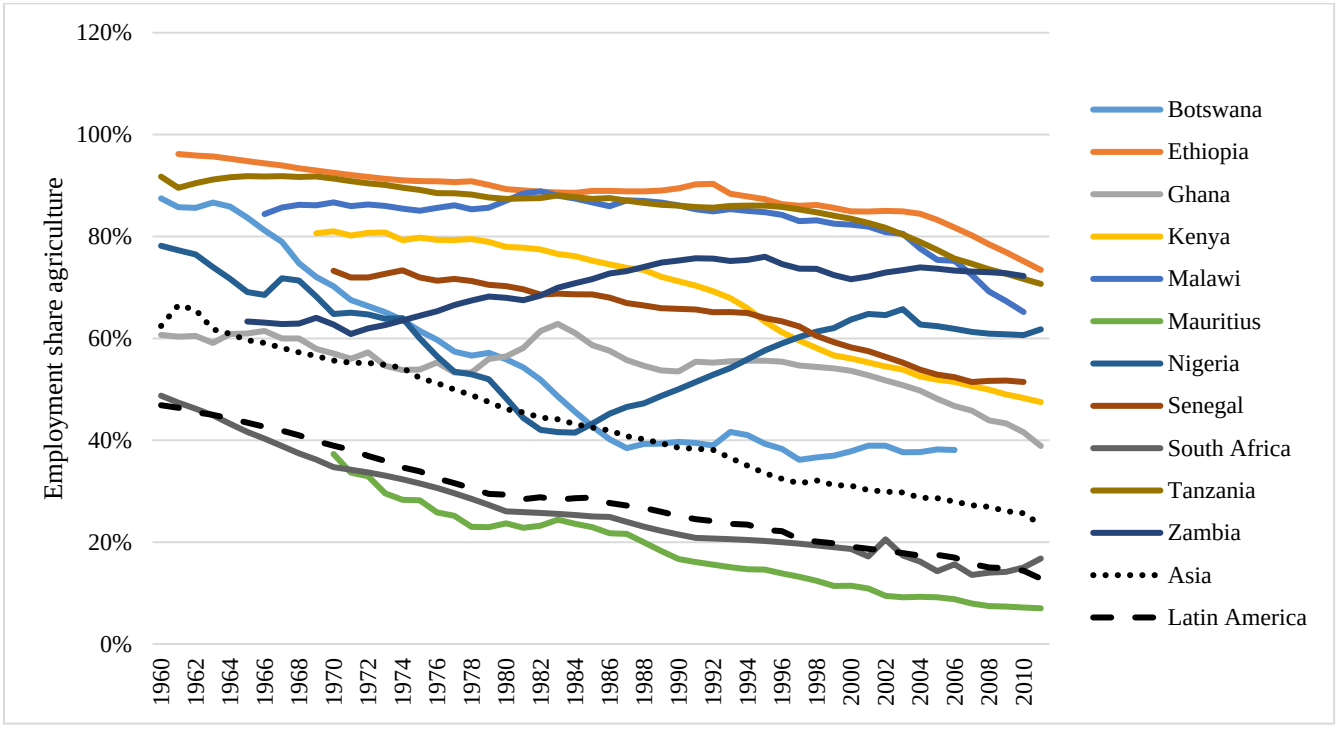
TABLE A3: Welfare and labor share in services

VARIABLES	(1) Welfare (2007) J&K	(2) Welfare (2007) J&K	(3) Welfare (2007) J&K	(4) Welfare (2007) J&K	(5) Welfare (2007) J&K
Africa share employment services			46.0611**	-64.3682	17.5096
			(0.014)	(0.382)	(0.369)
Africa share employment services square				104.9416	
				(0.291)	
Other regions					
EU/US share employment services			134.6929***	90.1990	120.4045***
			(0.000)	(0.178)	(0.000)
EU/US share employment services square				14.5794	
				(0.854)	
Asia share employment services			88.3391***	-138.8145**	-89.1743**
			(0.000)	(0.022)	(0.027)
Asia share employment services square				308.5760***	279.4794***
				(0.000)	(0.000)
Latin America share employment services			48.0603***	-42.8809	30.0629*
			(0.000)	(0.480)	(0.057)
Latin America share employment services square				80.5105	
				(0.316)	
Middle East North Africa share employment services			46.0125**	-66.0425	-63.7546
			(0.041)	(0.674)	(0.669)
Middle East North Africa share employment services square				124.3381	
				(0.702)	
Share employment services	132.7708***	-271.72***			
	(0.000)	(0.001)			
Share employment services square		421.6936***			
		(0.000)			
Dictator					35.9126
					(0.596)
Trade openness					-6.5708**
					(0.047)
Education					-0.6154
					(0.644)
Financial Liberalization					2.3508
					(0.101)
Constant	-40.5257***	39.6753**	-13.8287**	11.2194	3.6513
	(0.001)	(0.029)	(0.037)	(0.347)	(0.617)
Observations	37	37	37	37	35
Adjusted R-squared	0.558	0.748	0.905	0.947	0.953

pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1

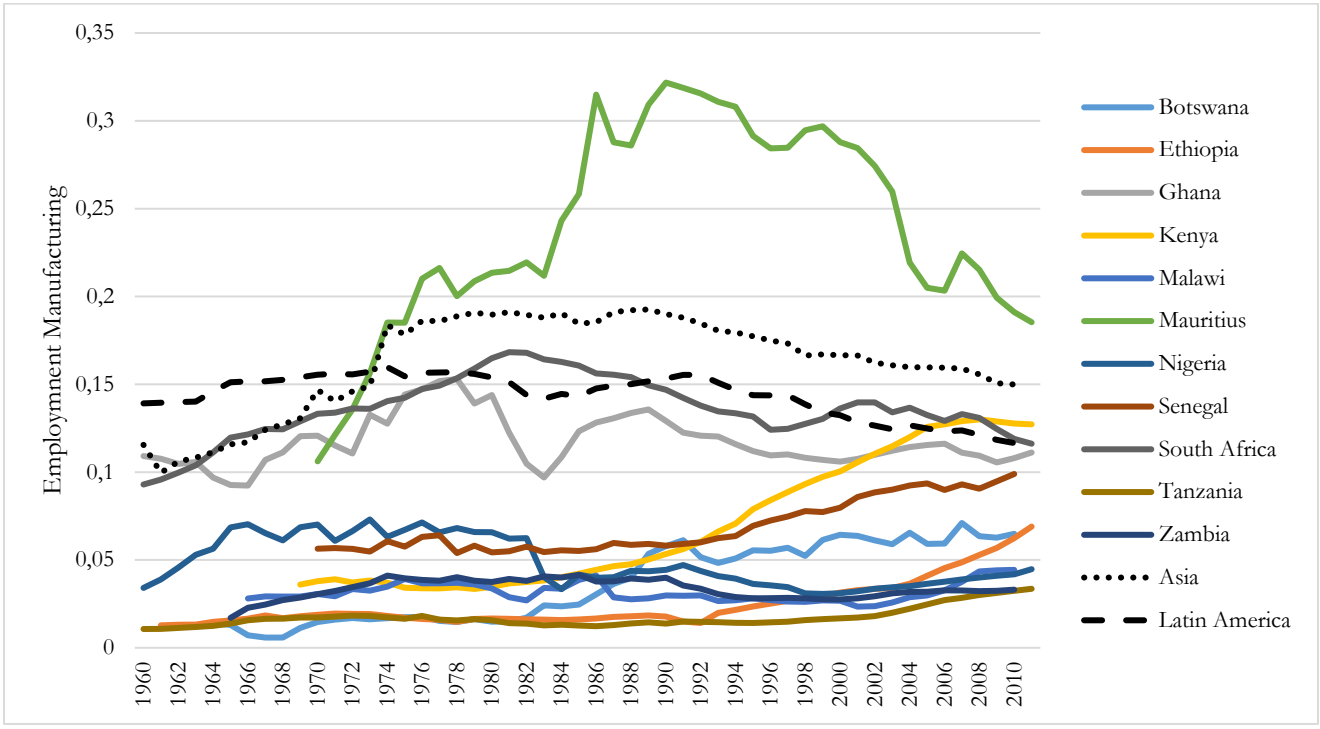
Appendix II

Figure A1: share of employment in agriculture, all countries



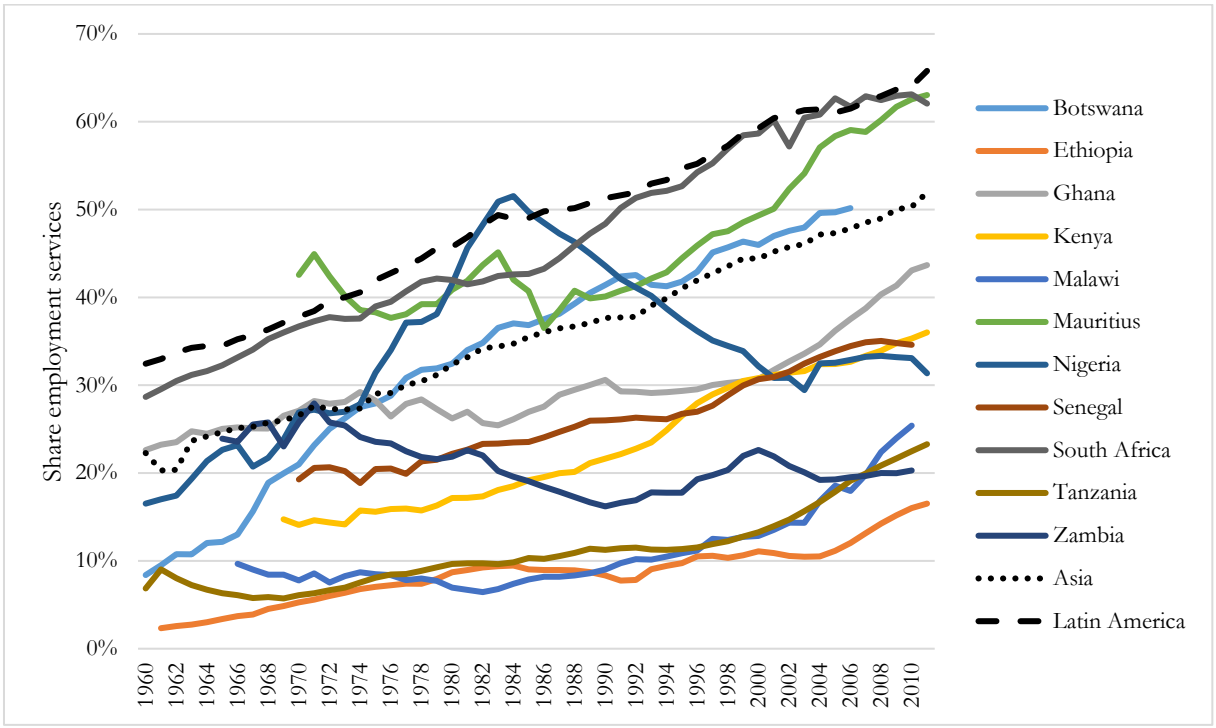
Source: African sector database (Timmer et. al, 2015)

Figure A2: *share of employment in manufacturing, all countries*



Source: African sector database (Timmer et. al, 2015)

Figure A3: *share of employment in services, all countries*



Source: African sector database (Timmer et. al, 2015)

Appendix III

Variable and source list

Group	Variable	Definition	Period
Inequality	$IneqM_{it}$	Measures of the dispersion of pay, using the between-groups component of a Theil index measured across industrial categories in the manufacturing sector; based on UTIP-UNIDO	1963-2008
	Ineq	Estimated household income inequality (EHII)	1960-2010
	Source: University of Texas Inequality Project – EHII (Galbraith & Kum, 2005): http://utip.gov.utexas.edu/data.html		
Sectoral employment	%EMP	Number of persons engaged (in 1000s) including paid employees, self-employed and family workers	1960-2008
	Source: Groningen Growth and Development Centre 10 Sector Database (Timmer et al., 2015): http://www.rug.nl/research/ggdc/data/10-sector-database		
Urbanization	%Urban	Urban population as percent of total	1960-2014
	Source: World Bank: http://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS		
Financial liberalization	FINAN	Degree of capital account openness	1970-2013
	Source: Chinn-Ito Financial Openness Index (Chinn & Ito, 2006): http://web.pdx.edu/~ito/Chinn-Ito_website.htm		
Trade openness & GDP per capita	TRADE	(Imports+Exports)/GDP (at current PPP)	1960-2013
	GDPPC	Output-side real GDP (mil., chained PPPs, 2005 US$)/Population	
	Source. Penn World tables 8 (Feenstra et al., 2013) http://www.rug.nl/research/ggdc/data/pwt/pwt-8.1		
Political system	DI	Dictatorship: authoritarian regimes that do not espousing international ideology	1963-2005
	MD	Military Dictatorship: authoritarian regime controlled or backed by military that do not espouse international ideology	
	W	Civil war: a country with competing interests that manifest themselves in violence	
	OD	One-party democracy	
	C	Self-declared communist	
	IR	Self-declared Islamic republic	
	SD	Social democracy: government selected on the basis of fair, multiparty elections and classified as a social democratic welfare state	
	EC	European colony: a non-European state that operates in part or full under the ownership and ideology of a European country	
	CO	Conservative democracy: government selected on the basis of fair, multiparty elections and classified as a liberal or conservative welfare state	
	Source: University of Texas Inequality Project - Political Regime Dataset: http://utip.gov.utexas.edu/data.html		
Education	EDUC	Average years of schooling (primary, secondary and tertiary education) of population aged 25 and older	1950-2010
	Source: Barro-Lee Educational Attainment Dataset (Barro & Lee, 2013): http://www.barrolee.com/		
Welfare	Welfare	Composite measure consisting of measures of consumption, leisure, mortality and income inequality.	1970 & 2007
	Source: Beyond GDP welfare measure (Jones & Klenow, 2016)		

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