Assessing the Inclusiveness of Growth in Africa
Evidence from Cameroon, Senegal and Tanzania*

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Abstract

In this study, we assess the inclusiveness of growth by tracking the yearly percentage change in individuals' household consumption over different growth spells in Cameroon, Senegal and Tanzania. With cross-sectional data, we track the consumption of groups of individuals that share similar time-invariant characteristics, consistent with the pseudo-panel methodology. When the panel data are available, we track the consumption of each individual in order to generate the non-anonymous growth incidence curve. We find that the standard GIC does not always help to detect or to identify the winners and the losers from the growth process. In addition, the more educated individuals are not necessarily the ones that benefit from growth, except in Tanzania where growth is driven by the skill intensive sectors. We also find significant losers from growth in Tanzania where the rate of inflation is very high compared to the other countries.

Keywords: Inclusive growth, Africa, Poverty, Inequality.

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1. Introduction

The reduction of poverty and inequality has been so far at the center-stage of both policy and academic debates all over the World.[1] In Africa in particular, implementing policies that reduce poverty and inequality is not only a fairness issue, but also a sustainable way to improve state capacity and maintain national peace. This goal can mainly be achieved through the growth process as evidenced by the case of China and India (Aghion and de Aghion 2004; Ravallion 2009). However, the current rise in economic growth in Africa has raised new concerns about whether or not it will increase the living standards of the poor and reduce the income gap between the poor and the rich (Chen and Ravallion 2010; Sala-i-Martin and Pinkovskiy 2010).[2]

The goal of this paper is to provide a way to assess whether there are losers and winners from the growth process in Cameroon, Senegal and Tanzania. It purports to check whether the growth process increases the living standards of all groups of society or some groups benefit more than others and the identity of these groups.

These questions are addressed by relaxing the anonymity principle underlying the standard Growth Incidence Curves (GIC). When panel data are not available, we take advantage of the pseudo–panel methodology to track the consumption of groups of individuals that share the same time-invariant characteristics. More specifically, we construct groups according to the birth generation, gender and level of education of the individuals between 25 and 55 years old in Cameroon and Senegal. We are then able to track the average consumption of these groups over each growth spell. For the case of Tanzania where panel data are available, we build the Non-anonymous Growth Incidence Curve (Na-GIC) by plotting the yearly percentage change in the consumption of each individual against its initial level of consumption.

We find that the standard GICs do not provide the whole picture of the losers and the winners from the growth process in our data. Instead, the non-anonymous growth incidence curves are much more informative; particularly when panel data are available. In addition, the less educated individuals, on average, live in poorer households. They benefit more from growth in Cameroon and Senegal; but not in Tanzania. Our results suggest that this outcome may be explained by the skill intensity of the sectors that contribute the most to the GDP growth. We also find that 63 percent of the population in Tanzania experience a fall in the consumption of their households; even though growth has raised the consumption of the poorest. We associate this finding to the role of price inflation which was much more significant in Tanzania than in the other two countries.

Our results fall into the growing literature on inclusive growth, but more generally on the literature related to the impact of growth on poverty and inequality. We complement this literature by providing a new way to assess, *not to measure*, the inclusiveness of growth using

[1] See Thomas Piketty's *Capital in the 21's century* and Ravallion (2013).

[2] According to the World Economic Outlook, 2012, the average GDP growth rate in Africa has been 5.2 percent between 2003 and 2012. Meanwhile, according to the PovcalNet website, the headcount index drops from 47 percent in 2002 to 40 percent in 2008.

either cross-sectional or panel data. In addition, like Grimm (2007) in Peru and Indonesia, we provide evidence in the African context about the shortcomings of using the standard GIC to infer about the distributional impact of growth. Our paper also provides a suggestive evidence of the role of education and monetary policies in driving the impact of growth on the living standards of individuals, consistently with findings by Rahul, Volodymyr, and Naresh (2014) in India.

The remaining of the paper is organized as follows. Section 2 presents a review of the literature that led to the emergence of the concept of inclusive growth and its empirical assessment. Section 3 presents the macro-economic performance of the selected countries and gives background information on major public policies that were implemented by the countries. Section 4 describes the dataset with an emphasis on the issues of comparisons of the results across countries and years. Section 5 presents the results and finally section 6 concludes.

2. Literature

As reviewed by Ranieri and Ramos (2013), the process in the development literature leading to the concept of inclusive growth is a long and remarkable rethinking of the links between growth, poverty and inequality. This process unfolds from the shortcomings of the 'trickle down' view of growth advocated by Kuznets (1955), as shown by Kanbur (2000) and Lopez (2004) ; and from the focus of the pro-poor growth literature on the bottom of the income distribution, as evidenced by Ravallion and Chen (2003) and White and Anderson (2001).

In this rethinking process emerged the concept of inclusive growth, based on the idea that growth consequences are not just limited to changing the distribution of income and the observation that, as growth affects differentially gender, ethnic and geographic groups, who and how people engage in the development process matters. Many definitions of inclusive growth have emerged with some of them being equivalent to the 'absolute pro-poor growth' or relative 'pro-poor growth' definitions Grosse, Harttgen, and Klasen (2008). However distinctions between the two concepts have been made. Klasen (2010) argues that while pro-poor growth is concerned about people whose income lies below the poverty line, **inclusive growth is more general with an emphasis on growth benefiting to all groups and all parts of the society**. Ali and Son (2007) defined inclusive growth as growth that increases social opportunities available to all the different stripes of the population. For Ianchovichina and Lundstrom (2009), growth is inclusive if it is sustainable in long run, and if it involves economic diversification and competition as well as if it is "broad-based across sectors, and inclusive of the large part of the country's labor force". Along the same lines, Bhalla (2007) emphasizes productive employment along with growth in productivity in existing jobs as key factors of inclusive growth.

Attempts to measure inclusive growth are fairly recent and far less numerous than attempts to conceptualize it. Habito (2009) assesses inclusiveness of growth in Asian developing countries, following a 'weak absolute pro-growth' definition and looking at the poverty elasticity of

growth. Ianchovichina and Lundstrom (2009) evaluate the pace and pattern of growth to determine what is lacking for a country's growth to be fully inclusive, paying attention to elements like geography and infrastructure, the cost of capital and the employability of the poor. An inclusive growth index was proposed by McKinley (2010) and includes indicators such as growth, income distribution and inequality, productive employment, economic infrastructure, gender equity, social protection and human capital. McKinley recognizes that data availability and the need for value judgments are caveats to the broad use of his index. Nevertheless, his inclusive growth composite index was applied to countries such as Bangladesh, Cambodia, India, Indonesia, Philippines, and Uzbekistan, an empirical attempt rare enough in this literature, to be worth mentioning. In a very recent paper, Ramos, Ranieri, and Lammens (2013) proposed to measure the inclusiveness of growth based on three factors: income poverty, inequality (as a proxy for the benefit-sharing part) and employment-to-population (as a proxy for the participation dimension). They then applied this measure to 43 developing countries to determine their inclusiveness in two points in time, as well as how it varies with GDP growth during the period.

On top of these measurements, many recent empirical attempts relied on the growth incidence curve (GIC) developed by Ravallion and Chen (2003) to assess the inclusiveness of growth and on the growth elasticity of poverty reduction to measure the pro-poorness of growth. On the one hand the GIC plots the initial quantiles of income distribution against their average yearly rate of variation over a given period. It illustrates "how the growth rate for a given quantile varies across quantiles ranked by [post growth] income". Growth is deemed inclusive when the GIC is downward sloping, that is growth benefits more to the poor. On the other hand, the growth elasticity of poverty reduction provides the rate of change in the poverty headcount index generated by a 1 percent increase in GDP growth.

In Cameroon, Senegal and Tanzania, the estimates of the growth elasticity of poverty reduction is between 0.2 and 2. In Cameroon, it decreased from 1.34 between 1996 and 2001 to 0.24 between 2001 and 2007 Essama-Nssah and Bassolé (2010). Similar decline in the growth elasticity was observed in Senegal where it decreased from 1.55 between 2001 and 2005 to 0.7 between 2006 and 2011 (Kireyev 2013). The latest estimate of the growth elasticity of poverty reduction is 2 in Tanzania. As regarding the growth incidence curves, it is flat in Cameroon between 1996 and 2001, and downward sloping between 2001 and 2007 (Essama-Nssah and Bassolé 2010). The reverse is observed in Senegal where the growth incidence curve is rather upward sloping (Kireyev 2013). Similarly for Tanzania, Osberg and Bandara (2012) show that it is upward sloping between 2001 and 2007.

Following the definition of inclusive growth given by Klasen (2010), the GIC may not be a good way of assessing growth inclusiveness, precisely because it relies on the anonymity principle. This principle, namely that the welfare function is invariant by permutation of individuals' incomes, abstracts from social mobility, the transition of an individual from one income state to another, which is at the core of the inclusive growth concept. To overcome this shortcoming in

the pro-poor growth framework, Grimm (2007) suggests removing the anonymity assumption by using panel data. He shows that when social mobility is significant, the GIC no longer yields the same profile as the non-anonymous growth incidence curve (Na-GIC). Bourguignon (2011) pushes even further this critique, by showing that the standard GIC cannot be used for welfare comparison when the utility functions of the individuals depend both on their initial and terminal income.

Building on this literature, we propose to assess growth inclusiveness by relying on the Na-GIC as in Grimm (2007). When panel data on individual consumption expenditures are not available, we take advantage of the growing literature of pseudo-panel to build quasi Na-GIC; that is growth incidence curves that follow the same group of individuals, characterized by their socio-economic characteristics, over a growth spell. In particular, we draw on Dang and Lanjouw (2013) who have demonstrated the relevance of using cross-sectional data to assess individual income mobility.

3. Background: Growth performance and Public Policies in Cameroon, Senegal and Tanzania

Cameroon and Senegal are two Western African countries while Tanzania is located in East Africa. Among the three countries, Cameroon is the richest one in terms of gross national income per capita followed by Senegal and Tanzania (see Figure 2). These three countries have been chosen primarily because of the availability of the relevant data for our analysis. Interestingly, each of them presents some particular features such that altogether they provide a richer framework to analyze the incidence of growth on well-being in Africa.

Indeed, the three countries recovered from an economic downturn during the first half of the 90s. However, their growth performance in the aftermath of this crisis was not similar (See Figure 2 in appendix). Cameroon performed better than Senegal between 1996 and 2000. The average growth rate of the GDP per capita over this period was 2.3 and 1.5 percent for Cameroon and Senegal respectively. This outcome is reversed during the next five years. The average GDP per capita growth in Cameroon fell down to 1.4 percent; whereas it rose up to 1.9 percent in Senegal. Unlike Cameroon and Senegal, Tanzania has had a better growth performance. Its average growth rate of the GDP per capita rose from 1.7 percent in 1996-2000 to 4 percent in 2006-2010.

According to the national account reports, the sectors that contribute the most to the growth performances in Cameroon are in order of importance food crops, fisheries, transportation, and trade. In Senegal, they are respectively telecommunications, trade, constructions, and food crops. In Tanzania, trade and repairs, food crops, construction, manufacturing, real estate business, public administration, communication and transportation are the major driving sectors of the

economy.[3] Given the growth performances, the skill intensity of these sectors may help explain the incidence of growth on consumption according to the level of education of the individuals.[4]

Table 1 in appendix presents the major public policies implemented in Cameroon, Senegal and Tanzania between 1994 and 2010. Actually, in all three countries, the recovery from the economic downturn of the early 90s was accompanied by a significant shift in public policies, particularly for monetary policy in the aftermath of the crisis and education and employment policies latter on (See table 1). Indeed, in 1994, Cameroon and Senegal underwent a currency devaluation of 50 percent, as members of the 'Franc CFA' currency union.[5] The main objective of the Central Bank of West African States was price stabilization after a decade of hyper-inflation. In addition, the currency union has been extended to an economic integration zone in 1994 to ensure economic convergence of the member states. Between 1996 and 2007, the average rate of inflation was 2.6 percent in Cameroon. In Senegal, it was at 32.3 percent in 1994 but quickly fell down to 2 percent on average between 1995 and 2006.[6] On the other hand, Tanzania modernized its central bank through the adoption of the 1995 Bank of Tanzania Act with a focus on price stabilization. However, the average rate of inflation stood at 10 percent between 1995 and 2007. This average rate persisted in 2008 but fall down to 6.2 percent in 2010.

A wave of liberalization and privatization of public utilities has accompanied the recovery from the early 90s economic downturn. In addition, primary school construction programs along with reduction in the registration fees have been implemented since the early 2000s. Furthermore, national health policy to fight HIV/AIDS and malaria were conducted since the late 90s.

4. Empirical Framework

a. Dataset

This study relies on several rounds of households surveys conducted in Cameroon, Senegal and Tanzania. As shown in Table 2 in appendix, we have three rounds of surveys for Cameroon (1996, 2001 and 2007) and Senegal (1994, 2001 and 2006) and two rounds for Tanzania (2009 and 2011). The data from Cameroon and Senegal are cross-sectional; whereas we have panel data for Tanzania. These datasets comprise of the consumption expenditures of each household

[3] We select those sectors that contribute more than the average contribution. In 2007, the growth rate of GDP in Tanzania was 3.4 percent. The contribution of the main sectors is: food crops and fisheries (1.2%), transportation (0.7%) and trade (0.4%). This structure is similar for the previous years (1996-2006).
The average GDP growth rate in Senegal is 4 percent. The sectors that contribute the most to GDP growth were respectively post and telecommunications (0.7%), trade (0.5%), construction (0.3%) and food crops (0.1%).
Regarding Tanzania, the average growth rate was 6.1 percent between 2009 and 2011. Over this period, the following sectors contribute the most to the economy: trade and repairs (0.94%), Crops (i.e. agriculture: 0.80%), construction (0.72%), manufacturing (0.71%), real estate and business (0.60%), public administration (0.50%), communications (0.44%) and transportation (0.35%).

[4] Table 7 in appendix confirms this insight.

[5] Cameroon and Senegal belongs to the CEMAC and UEMOA respectively since their independence from France in 1960.

[6] Note that the variance of the inflation rate over this period is larger in Senegal than in Cameroon.

as well as individuals' socio-demographic characteristics such as the year of birth, gender and the level of education (See Table 1).[7] Contrarily to Tanzania, data on expenditures from Cameroon and Senegal are only available in nominal value.

We complement these datasets with information on consumer price index (CPI) from the World Development indicators' online database managed by the World Bank (WDI). Since the surveys from Senegal and Tanzania were not conducted over a single year, we match the households' nominal expenditures with the CPI measured during the first year of the survey, except for the third round of the Senegalese survey (See Table 1).

b. The measurement of individual well-being

We measure individual well-being with the real annual consumption expenditures per adult equivalent of his household. To allow for cross-country comparisons the consumption expenditures are expressed in 2005 US dollars Purchasing Power Parity (PPP) using the formula:

$$ExpendR_j = \frac{Expend_j}{AdEq_j * (1+\pi) * PPP}$$

Where $ExpendR_j$ is the real annual consumption expenditures per adult equivalent, $Expend_j$ is the nominal annual expenditures; $AdEq_j$ is the aggregate adult equivalent in household j; π is the rate of inflation and PPP is the PPP-conversion factor of private consumption retrieved from the WDI database. The aggregate adult equivalent is obtained by using the FAO's equivalence scale (See Table 1). In Tanzania a real annual expenditures is provided by the national office of statistics based on a specific price index. This price index accounts for regional and monthly variation, unlike the CPI. Our results rely on the real expenditures based on the consumer price index provided by the World Bank ; but we compare them to the results obtained using the real expenditures computed by the Tanzanian office of statistics, as a robustness check.

One of the key issues about the use of the expenditures variable from household surveys stems from the fact that the very rich/poor households are not generally observed. These missing observations may bias the growth of the expenditures at the extremes of the consumption distribution. Our interpretation of the results accounts for this fact.

Another issue is the life cycle effect that can affect the comparison of an individual's household consumption over time (Guénard 2001). This is because the consumption per adult equivalent within a household depends both on the number of contributors and the household's size. For instance, newly married individuals are likely to live in households with higher consumption per adult equivalent; whereas retired people tend to have lower consumption. The transition from one case to another could drive the change in household's expenditures between two waves of

[7] Information on individuals' income is not available in all surveys, and when there are available, they suffer from several missing values.

surveys. This life cycle effect is strongly linked to the age of the individual. In order to adjust the consumption for this effect, we take the residuals from the regression of the consumption on a quadratic polynomial of age. More specifically, we append the dataset from all the different countries and different years. Then we regress consumption expenditures on age and age squared controlling for country and year specific effects.

$$Expend_{\mathrm{i,j,kt}} = \alpha + \beta_1 age_i + \beta_2 age_i^2 + \gamma\, country_j + \delta year_t + \varepsilon_{i,j,kt}$$

Where $Expend_{\mathrm{i,j,kt}}$, refers to the real expenditures of household j in country k and year t, age_{i} refers to the age of individual i, $country_{\mathrm{j}}$ is a dummy to indicate in which country individual i lives, $year_{\mathrm{t}}$ is a dummy indicating the round of survey from which the observation comes (it can take three values 1, 2 and 3 for the observations in Cameroon and Senegal, and two values 1 and 2 for the observations in Tanzania). The rest of the analysis is carried out on the real annual consumption expenditures defined by:

$$adjExp = a + \gamma\, country_j + \delta year_t + \varepsilon_{i,j,kt}$$

In other words, the real expenditures of an individual's household are adjusted for his age.

c. Summary statistics

Table 5 in appendix presents the summary statistics of the consumption expenditures variable. Consistently with the statistics on real national income per capita, the statistics presented in the summary table imply that average consumption is the highest in Cameroon, followed by Senegal and Tanzania. While the average consumption rises in Cameroon and Senegal, it declines in Tanzania over the period of observation. More specifically, it rises by 1.3 and 2.5 percent respectively over the periods 1996-2001 and 2001-2007 in Cameroon. Likewise, the average annual variation in consumption expenditures in Senegal is lower (0.8 percent) over the first period (1994-2001) than over the second period (5.4 percent between 2001 and 2006). In Tanzania, it falls by an average of 8 percent between 2009 and 2011.[8]

Figure 3 highlights how these average rates of variation translate into a general shift in the distribution of consumption. This information is provided on the left panel of the figure which presents the cumulative distribution (CDF) of consumption expenditures. For both Cameroon and Senegal, the increase in average consumption is confirmed by the downward shift in their respective CDF; whereas in Tanzania there is rather an upward shift in the CDF between 2009 and 2011. In terms of the headcount index of poverty, these outcomes imply that poverty decreases in Cameroon (1996-2007) and Senegal (1994-2006), but rises in Tanzania between

[8] Note that this rate of decrease in consumption expenditures for Tanzania is much lower when we rely on the real expenditures provided by the national office of statistics; but still negative (-0.3 %).

2009 and 2011.[9] These results are complemented by the Lorenz curves on the right panel of Figure 3. They show that inequality falls in Cameroon more significantly between 2001 and 2007 than during the period 1996-2001. On the contrary, it remains almost stable in Senegal between 1994 and 2001; but slightly rises between 2001 and 2006. In Tanzania, there is no change in inequality between 2009 and 2011, as measured by the area between the Lorenz curve and the 45° line.

In addition to these statistics, we also present in the result section the growth incidence curves which show how the average change in consumption expenditures varies according to the centiles of consumption. For the purpose of comparison, they have been constructed over the sample of individuals between 25 and 55 years old at the baseline of each survey. The actual GIC computed over the whole sample can be found in figure 5 in the appendix. Altogether, they provide an overview of the evolution of poverty and inequality in the three countries. However, they do not tell us how the living standard of any group of individuals has changed over the period considered. This is primarily because they rely on the anonymity principle. In the following subsection, we present our methodology to assess the inclusiveness of growth; that is the extent to which a growth spell has raised the living standards of all individuals in the society.

d. Methodology to assess the inclusiveness of growth

We assess the inclusiveness of growth by tracking the change in each individual's consumption over time. Therefore, the assessment of growth inclusiveness amounts to identifying who – which groups - benefits from growth and to which extent. The growth incidence curve is used to measure the pro-poorness of growth. Even though it relies on the whole distribution of consumption/revenue, it is not suitable for the assessment of growth inclusiveness because of the anonymity principle underlying its construction. In fact, the GIC measure the yearly percentage change in the quantiles of consumption. It does not focus on the change in living standards of particular individuals but rather assess the change in the distribution of consumption/income as a whole. By doing so, it abstracts from income mobility which however can be particularly important, notably in developing countries, as suggested by the literature on poverty dynamics (See Woolard and Klasen (2005)).

Following Grimm (2007), we depart from the anonymity principle underlying the GICs to assess the inclusiveness of growth. Unlike the standard GICs, Non-anonymous GICs (Na-GIC) measure the yearly percentage change in each individual consumption/revenue. Ideally, its construction is based on panel data which allow tracking the consumption of the same individuals over several years. With the exception of Tanzania, we do not have panel data. Therefore, we rely on the pseudo-panel methodology as implemented by Dang and Lanjouw (2013) in order to track groups of individuals with the same time-invariant characteristics (typically, the year of birth, place of birth, and gender are relevant characteristics that can be used to construct the pseudo-

[9] This is valid if poverty is measured by the headcount index and the poverty threshold is held fixed.

panels). The more time-invariant characteristics are available, the better we can approximate the Na-GIC using cross-sectional data.

Strictly speaking, the growth incidence curve obtained using the pseudo-panel can be viewed as a *quasi Na-GIC*; that is anonymity is lifted to the extent that we can identify individuals with some of their time-invariant characteristics. It depicts how the consumption of the poorer groups of individuals changes with respect to that of the richer groups of individuals, where the groups are identified with these time-invariant characteristics. By relying on cross-sectional data, the quasi Na-GIC mitigates the attrition bias which can be significant in panel data. However, we are forced to depart from an analysis of growth's benefits at the individual level; but can only identify whether some groups of individuals have not benefited from growth. Given that only cross-sectional data were available for Cameroon and Senegal, we build the quasi Na-GIC for these countries. In Tanzania, on the contrary, we are able to build the exact Na-GICs for using the panel structure of its dataset.

We estimate the Na-GICs non-parametrically. In particular, this estimation relies on three time-invariant characteristics due to the available information from the datasets. These time-invariant characteristics are the year of birth, the gender and the highest level of education of the individuals between 25 and 55 years old at the baseline of the survey in Cameroon, Senegal and Tanzania.[10] The lower bound of the age interval is chosen to ensure that the level of education is held fixed for the individuals within the sample. The upper bound of the age interval ensures that our estimates are not affected by missing observations. In order to identify the driving factor of the profile of the Na-GIC and in particular the incidence of growth on the living standards according to the level of education, we complement the non-parametric estimation of the quasi Na-GIC with a parametric one. The details of both the non-parametric and parametric estimation are provided in the following paragraphs.

Non-parametric estimation of the Na-GIC:

The estimation of the Na-GIC relies on the households consumption expenditures, adjusted for the life-cycle effect. It is the graph that plots the average annual rate of variation in this consumption against the pre-growth level of consumption expenditures. More formally, let r_i denotes the average annual rate of variation in individual *i*'s household consumption Y_{it} over the period spanning from *t* to *t+T*;

$$r_i = \left(\frac{Y_{it+T}}{Y_{it}}\right)^{\frac{1}{T}} - 1$$

The Na-GIC is the scatter plot of the couples (Y_{it}, r_i). In order to trace out the general trend in this scatter plot for Tanzania, we implement a locally weighted regression with an optimal bandwidth for the Lowess methodology (See Hardle 1990). This Lowess represents the analogue to the standard GIC when the anonymity principle is relaxed. This approach, applicable to

[10] The baseline of a survey corresponds to the year of the first available survey.

Tanzania, uses the whole information available in the data, instead of relying on the average consumption per quantiles of the consumption distribution as in (Grimm 2007).

One interesting feature of this approach is that we are able to characterize the Na-GIC by the share of population whose household consumption increases and the share of the population whose household consumption increases more than the average. We can also plot the Lowess based Na-GIC for a subgroup of the population according to their level of education.

When panel data are not available like in Cameroon and Senegal, we build the quasi Na-GIC by generating 36 groups of individuals according to their birth generations, gender and level of education. We construct 6 birth generations by aggregating birth cohorts five by five, from the sample of individuals between 25 and 55 years old. The number of years of education is transformed into three levels of education (none, primary and secondary) in order to make this information consistent across all the datasets.[11]

Then we compute the weighted average consumption of the households of the individuals belonging to each group. The consumption is adjusted for the life cycle effect as presented in section 4.b. The average is computed for each group for all the countries and years. Then, we compute the yearly percentage change in the average consumption of each group over two consecutive waves.

If Y_{gt} denotes the average consumption of group g at year t, and T is the time lag between two consecutive survey, the yearly percentage is estimated as the geometric average over the period between the two surveys:

$$r_g = \left(\frac{Y_{gt+T}}{Y_{gt}}\right)^{\frac{1}{T}} - 1$$

The non-parametric estimation of the quasi Na-GIC is the curve that represents the set of couples (Y_{gt}, r_g).

The average consumption is heavily affected by the unobserved random characteristics so that it is difficult to read the general trend of the original quasi Na-GIC. To circumvent this problem, we again implement the Lowess approach (Hardle 1990). This method yields a smoother curve that exhibits the general trend of the quasi Na-GIC.

Parametric estimation of the quasi Na-GIC:

In order to disentangle the role of each time-invariant characteristic, particularly the role of education, in driving the general profile of the quasi Na-GIC, we assume a linear relationship between the consumption of a household and the characteristics of its members using the following econometric model:

$$Y_{it} = \alpha_t + \beta X_i + \varepsilon_{it}$$

[11] With the exception of the Tanzanian dataset, the information on education is clustered into level of education.

Where Y_{it} is the life-cycle adjusted consumption of the household of individual i in year t. X_i is the vector of time-invariant characteristics of the individual i. Finally, ε_{it} is the unobserved component of the consumption of the household of individual i. It is assumed to be random with zero mean.

The predicted value of this regression gives the average consumption of individuals from group g (those with the same characteristics X_i). These predicted values are used in place of the average consumption per group to estimate the quasi Na-GIC as in the non-parametric case. Here, we include in the regression birth cohort dummies instead of birth generation dummies, to take advantage of the linear structure of the model. Apart from allowing to disentangle the role of education in driving the general profile of the Na-GIC, this approach corrects for measurement errors that could affect the change in the consumption between two waves of a survey.

5. Results

The results from the three countries (Cameroon, Senegal, and Tanzania) provide a general picture of the inclusiveness of growth over different growth episodes and with different types of data (cross-section and panel). For each country, we present the non-parametric estimation of the Na-GIC, emphasizing the key differences with the results from the standard GIC. Then, we explain the general trends that can be inferred through the parametric as well as from the non-parametric Na-GIC, according to the time-invariant characteristics, particularly the level of education among the individuals between 25 and 55 years old.

On the graphs presenting the parametric estimation (for instance the two graphs at the bottom of Graph 1), we may distinguish three pairs of bars. Each pair is associated with a level of education. As shown in Table 6, more educated individuals generally live in richer households. Thus, the pairs of bars from the left to the right of each graph correspond respectively to the group of individual with none, primary and secondary level of education. Within a pair, each bar is associated to a gender and within a bar, each dot represents a birth cohort. In order to interpret the slope of a bar, we need to rely on the sign of the correlation between the year of birth and the household's consumption. This correlation can be read in the regression Table 6 of the appendix. The sign of this correlation is not always the same. It is positive in 1996 in Cameroon; but negative in the other cases. When the correlation is positive and the scatter plot for a given gender and level of education is downward sloping, it means that, on average, older cohorts benefit more from growth than the younger ones.

In both Cameroon and Senegal, the standard GICs suggest that all groups benefit from growth in both periods.[12] This contrasts with the results from the Na-GIC, whereby there is a fall in the consumption of some groups, particularly between 1996 and 2001 in Cameroon and between

[12] The word "group" refers to the 36 groups of individuals defined according to their birth generation, gender and level of education.

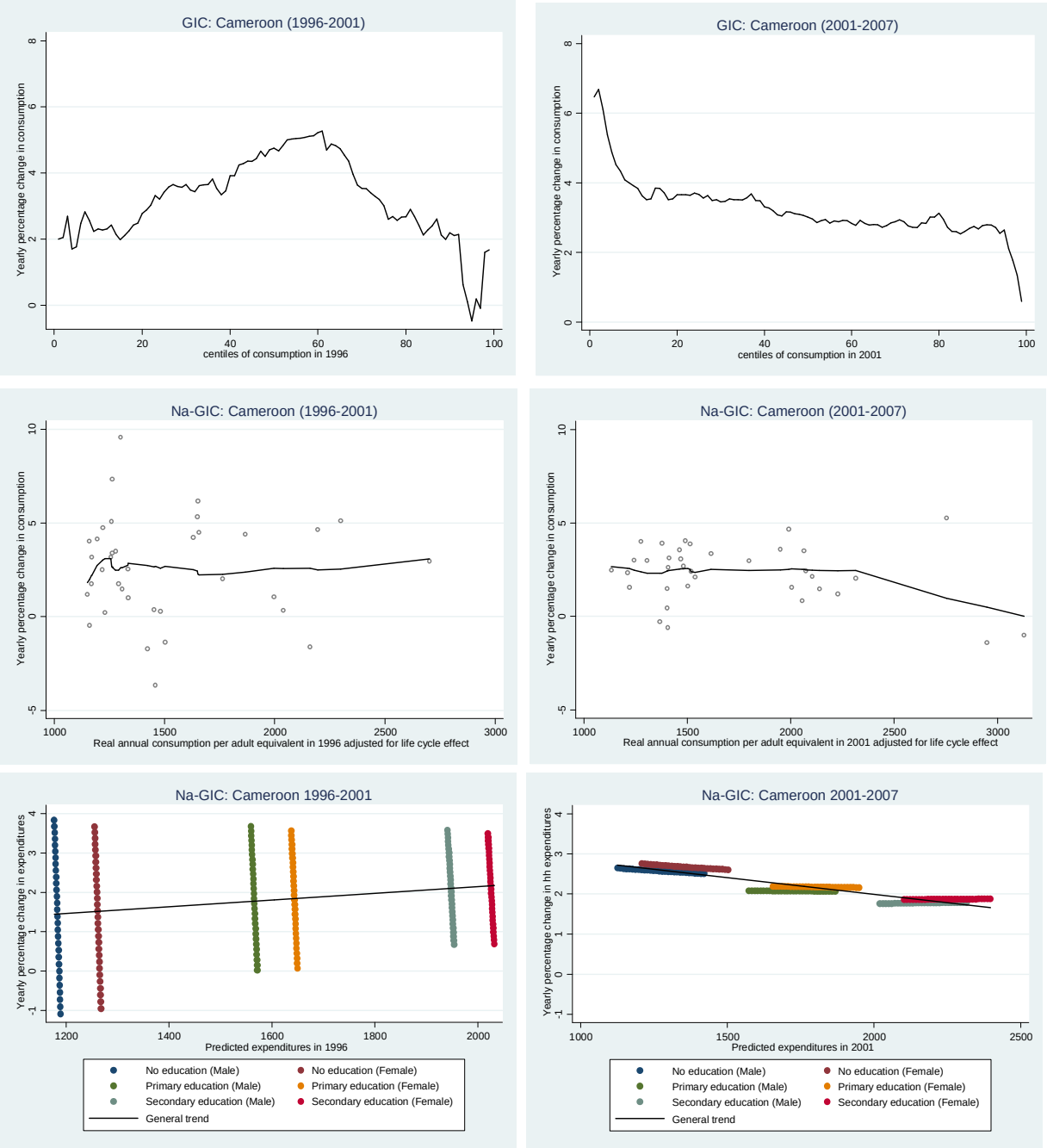
1994 and 2001 in Senegal. In Cameroon, it is the poorer groups that experience a fall in their consumption; whereas this fall affects the richer groups in Cameroon over these periods.

In terms of the relative benefit from growth across different groups, we observe that yearly percentage change in consumption is almost and generally the same across all groups in Cameroon. In fact the Lowess curve is flat for both periods of observation.

The flat trend in the Na-GIC observed for Cameroon over the period 1996-2001 is driven by a mixture of the inclusiveness of growth along the birth cohorts and the level of education. Indeed, as presented in the figure below the younger cohorts, which generally live in richer households, benefited less from growth than the older cohorts. Particularly, those who are not educated have even experienced a fall in the consumption of their households. Meanwhile, growth has been more beneficial to the households of those individuals which are better educated. The general trend is actually upward sloping. However, there is not much difference between the women and men in terms of the rate of variation in the consumption of their households for a given level of education and birth cohort.

The determinants of the trend in the Na-GIC are not the same over the period 2001-2007. Actually, the downward sloping shape of the Na-GIC over this period is mainly driven by the level of education. As presented in Graphs 1 below, for a given level of education, there is no difference in the rate of variation of the consumption of the households of the younger *versus* the older. We observe a small difference in the incidence of growth in favor of the women with respect to the men. The main difference emerges when we compare the incidence of growth on the household's consumption of those individuals with different level of education. As shown in Graphs 1, the households of the better educated individuals experience lower yearly percentage change in their consumption than those of the less educated individuals.

Graphs 1: Results for Cameroon



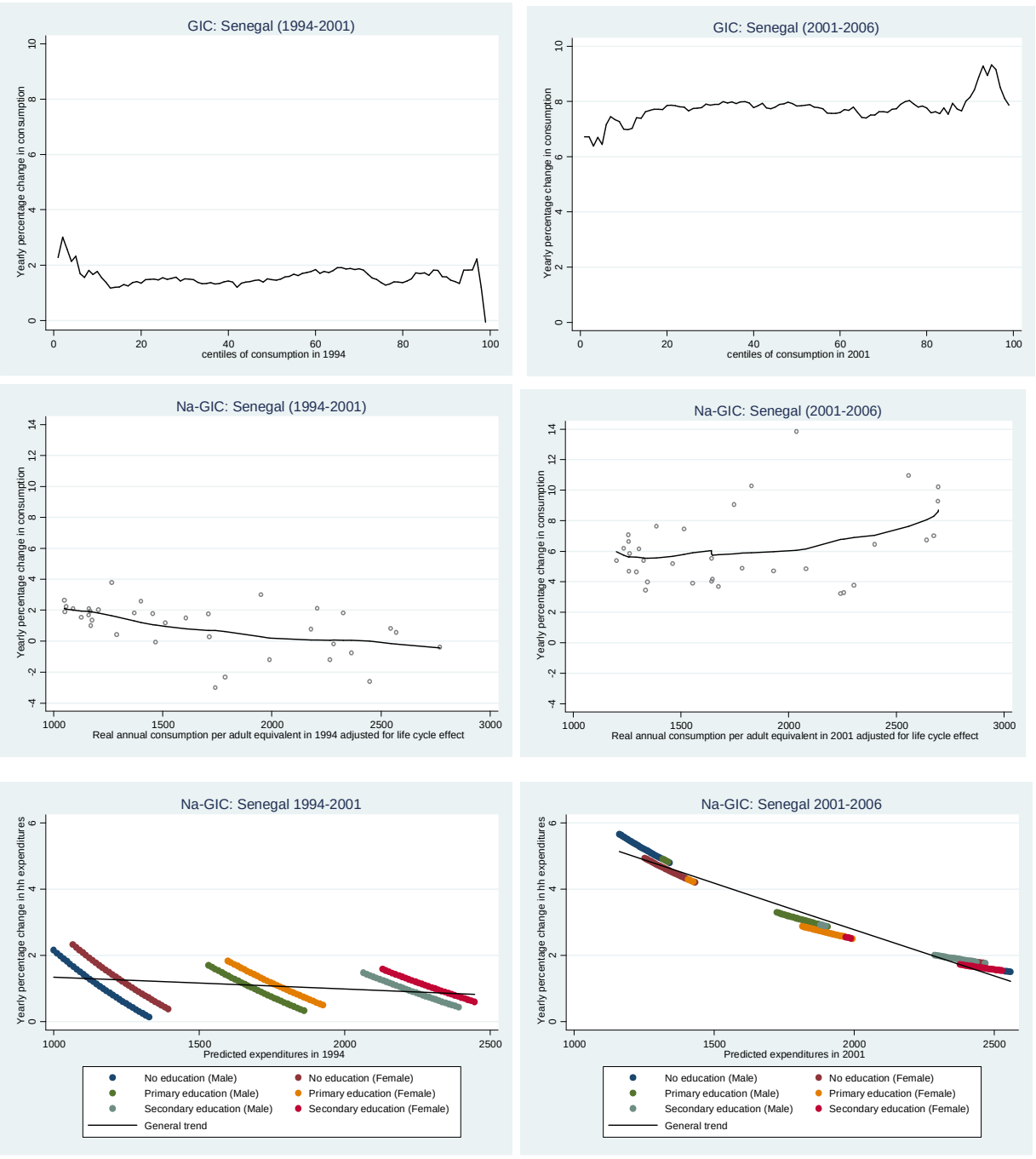
Note: The gray hollow circles in the Na-GIC graph represent the actual observation; whereas the solid line is the Lowess estimation of the relationship in the data.

Unlike the case of Cameroon, the poorer groups in Senegal benefit more from growth than the richer ones between 1994 and 2001 (Graph 2). The reverse holds between 2001 and 2006 even though the yearly percentage increase in consumption is almost three times higher over this period, consistently with a higher GDP growth rate.

As shown in the figure presenting the parametric Na-GIC, the downward sloping profile of the Na-GIC in Senegal between 1994 and 2001 stems from the fact that younger cohorts, who generally live in poorer households, have experienced a higher increase in the consumption of their households than the older cohorts. This is true irrespective of the gender and the level of education of the individual. There is no difference between women and men. However, the less educated individuals, who generally live in poorer households, benefited more from growth than the more educated ones.

It is harder to disentangle the driver of the profile of the Na-GIC in Senegal between 2001 and 2006 because of the opposite slope yielded by the parametric and the non-parametric approaches. However, it stands out clearly that the less educated individuals, who generally live in poorer households, have experienced a larger increase in the consumption of their households over this period than the more educated individuals.

Graph2: Results for Senegal



Note: The gray hollow circles in the Na-GIC graph represent the actual observation; whereas the solid line is the Lowess estimation of the relationship in the data.

The results from Tanzania (Graph 3) highlight how misleading the standard GIC might be. As shown in the figures below, the standard GIC suggests that almost every group in the country is losing from growth; while the Na-GIC shows that there are winners, particularly at the bottom of the distribution of consumption. These results are robust to the price index, whether the World

Bank CPI or the price index provided by the national office of statistics (See Figure 4 in appendix). The progressive profile observed in Tanzania may be affected by measurement error as pointed out by Glewwe (2012). Yet, the result of the parametric estimation presented at the bottom left of Graph 3 confirms the overall downward sloping shape of the Na-GIC curve.

Two additional results stand out from these figures. First, in spite of an average 3.4 percent growth in GDP per capita between 2009 and 2011, more than half of the population (63%) has experienced a fall in the consumption of their households. In addition, 62 percent of the Tanzanian population live in a household whose consumption increase less than the average yearly percentage change, which is -1.1 percent.[13] This massive fall in real consumption is associated with a high rate of inflation. As a matter of fact, the CPI went from 142 in 2009 to 170 in 2011.[14] This is not the case in Cameroon and Senegal where the rate of inflation is held below 3 percent over the whole period.

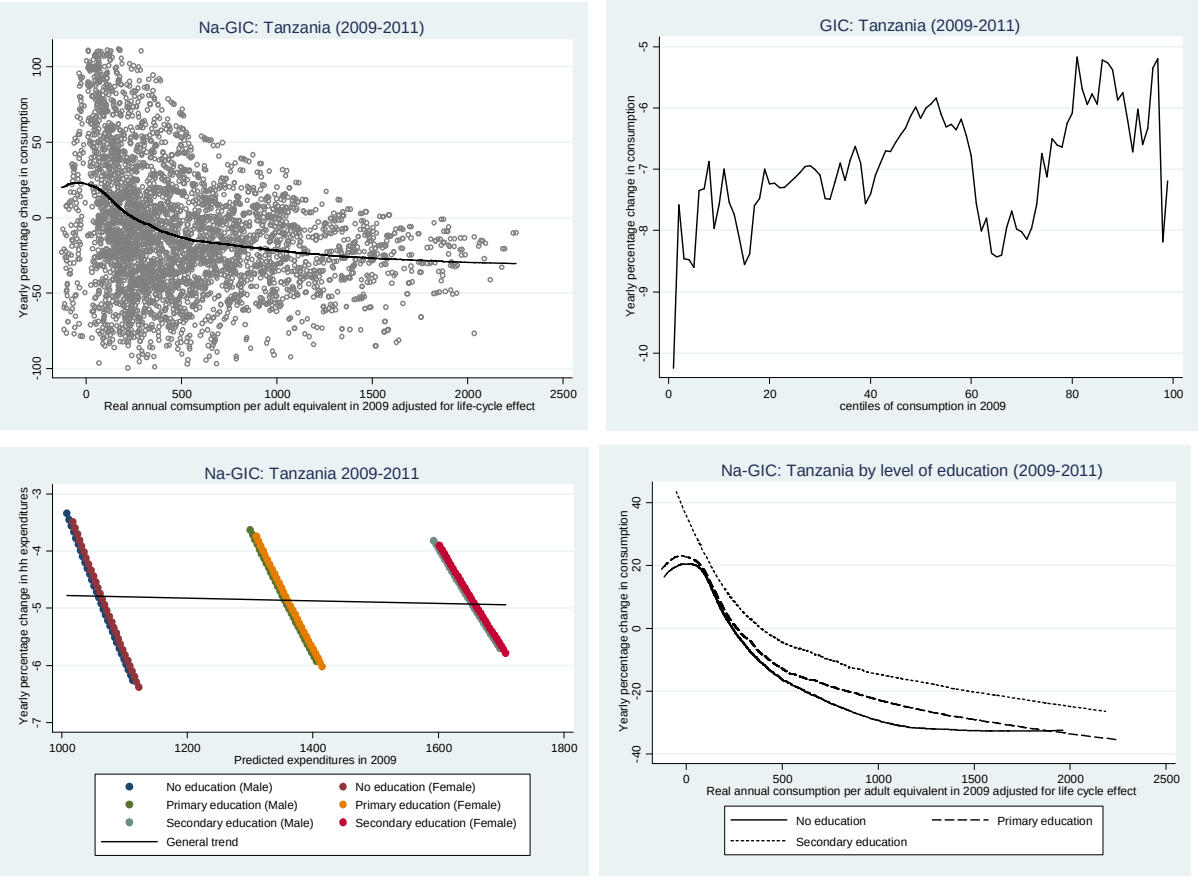
Second, there is more variation in the yearly change in consumption at the bottom of the distribution. As shown in the Na-GIC in the figure below, the poorer individuals tend to live in households which experience ever a fall or a rise in its consumption.

The same patterns are observed when the sample is split according to the highest level of education. However, contrary to the results in Cameroon and Senegal, the more educated individuals tend to benefit more from growth than the less educated ones. Actually, there is an upward shift in the Lowess curve, the higher the level of education (See figure below). We can associate this contrasting result to the skill intensity of the sectors that contribute the most to the GDP growth in Tanzanian economy as (See Table 7 in appendix).

[13] These figures are respectively 52 and 66 percent when we use the real expenditures provided by the national office of statistics.

[14] The World Bank's Consumer Price Index does not account for heterogeneity in the rate of inflation across the regions and months of the survey; unlike the price index used by the state office of statistics.

Graph3: Results for Tanzania



Note: The gray hollow circles in the Na-GIC graph represent the actual observation; whereas the solid line is the Lowess estimation of the relationship in the data.

Conclusion

In this study, we assess the inclusiveness of growth by tracking the yearly percentage change in individuals' household consumption over different growth spells and in different countries. With cross-sectional for Cameroon and Senegal, we rather track the consumption of groups of individuals that share the similar time-invariant characteristics, consistent with the pseudo-panel methodology. When panel data are available, we track the consumption of each individual in order to generate the non-anonymous growth incidence curve. Both methodologies depart from the standard growth incidence curve used to assess the inclusiveness of growth, which relies on the anonymity principle.

Our approach yields two results. First, the standard growth incidence curve does not necessarily allow to detect or to identify the winners and the losers from the growth process. This is consistent with the findings from Grimm (2007) in Peru and Indonesia. Second, the more educated individuals are not necessarily the ones that benefit from growth, except in Tanzania where growth is driven by the skill intensive sectors. We also find significant losers from growth in Tanzania where the rate of inflation is very high compared to the other countries. Actually, 63 percent of the population lives in households whose consumption falls during the growth spell. These results accord well with the conclusion by Rahul, Volodymyr, and Naresh (2014) in India.

In terms of policy implications, our results suggest that the better educated individuals are not necessarily those who benefit from growth. Whether they benefit more from growth depends on the driving sectors of growth in the economy. In addition, inflation can inhibit the benefit of growth like in the case of Tanzania. Our methodology also allows to better assess the groups that are left behind within a growth spell, and therefore offers an important tool for the design of redistributive policies.

However, while our study describes the incidence of growth on individuals' consumption across countries and over different periods, it does not say anything about the welfare comparison across the different non-anonymous growth incidence curve. One could use the dominance criteria provided by Bourguignon (2011) in order to derive a measure of growth inclusiveness that is monotone in the social welfare.

To refine the analysis with cross-sectional data, one could consider the inclusion of more time-invariant characteristics such as ethnicity, religion, place of birth if available in other surveys. As we demonstrated, the framework of Dang and Lanjouw (2013) is particularly appropriate for deriving the Na-GIC with cross-sectional data. Ideally, access to panel survey like in the case of Tanzania could provide a better long term view of the incidence of growth on individuals' living standards.

Finally, another line of research is to consider other dimensions of welfare like the living conditions. Subjective measures of wellbeing could also be a complementary way of assessing the inclusiveness of growth.

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Appendix

Figure 1: Gross National Income per capita in Cameroon, Senegal and Tanzania

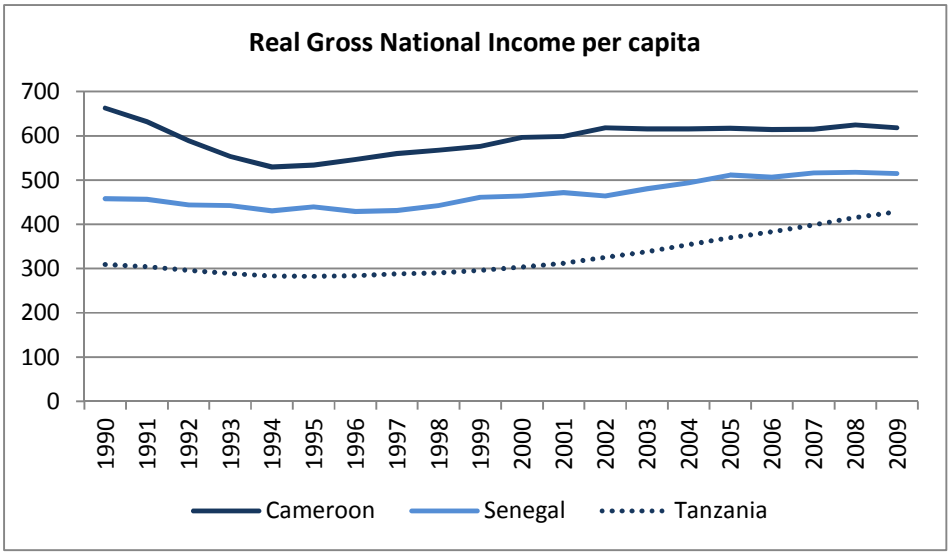
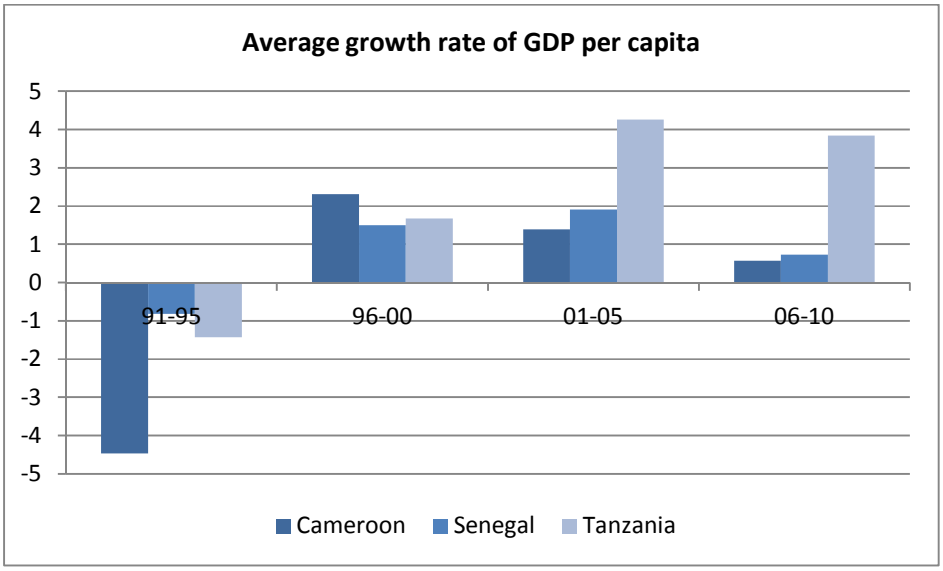


Figure 2: Growth rate of the GDP per capita



Data source: African Development Indicators, World Bank, as of December 2013. Gross Domestic Product (GDP) and Gross National Income (GNI) are in constant 2000 dollars US. An arithmetic average is used to compute the average growth rates over five years in order to smooth out short-term fluctuations. For the GNI, data for 2010 are not available. We therefore input the average growth rate over 2006-2009 as an estimate for 2010. All figures are in percentage.

Table 1: Major Public Policies implemented in the three countries

Major Policies	Cameroon	Senegal	Tanzania
Monetary	Devaluation of the common currency in 1994 Focus on price stabilization		1995. Bank of Tanzania Act. Focus on a single objective of price stability.
Fiscal	50% cut in public spending (salary of public servants) from 1994. VAT introduction in 1999. Progressive rate for income tax in 2004. Export taxes abolished in July 1998	Adjustment and reform program in 1994. Budgetary consolidation strategy based on reduction in public spending.	Income Tax Act 2004. Enlarging the tax base and adapting to globalization
Infrastructures	Privatizations (97-99) of rail and air transports Construction of a Pipeline Chad-Cameroon (2000)	25-year concession granted to TRANSRAIL S.A. (railway company) in 2003. 2005-2013: Construction of a highway Dakar-Diamniadio	Process of liberalization and privatization of the national infrastructure companies. Phase 1: 1993-1999. Concerned small manufacturing and service oriented parastatal Phase 2: 2001 – 2004. Big enterprises in telecom, transport, energy and mineral, water and finance system.
Education	Registration to primary school is free since 2000.	Decennial Program for Education and Training (2001-2010). 2004: Program of Skills Development for Youth and Adults – EQJA	The Education Sector Development Program (1997) revised in 2001 and 2008. The Education and Training Policy (1995). The Technical Education and Training Policy (1996). The Higher Education Policy (1999). Community Development Policy (1996). The Child Development Policy (1996).
Health	Enfant VIH/sida (EVS) (2003-2012) SSSC (2001-2011)	1995: National Program to fight malaria. Programme National de Développement Sanitaire et Social (1998-2007)	National health policy 1990, updated in 2003 and 2007.

Sources: Country Policy Reports

Table 2: Description of the datasets

	Cameroon			Senegal			Tanzania	
	ECAM 1	ECAM 2	ECAM 3	ESAM 1	ESAM 2	ESPS 1	TZNPS 1	TZNPS 2
Survey period	feb. - april 1996	sept. - dec. 2001	sept. - dec. 2007	march 1994 - April 1995	June 2001 - June 2002	dec. 2005 - April 2006	oct. 2008 - oct. 2009	oct. 2010 - sept. 2011
Matching year	1996	2001	2007	1994	2001	2006	2009	2011
Survey design	Two-stage sampling with stratification. The geographic areas of stratification evolve between the surveys, but the representativeness of rural areas is maintained. Within a given strata, enumerating areas were drawn at the first stage and households were drawn at the second stage							
Number of households	1,731	10,992	11,391	3,277	6,594	13,565	3,265	3,924
Number of individuals	10,325	56,927	51,837	32,544	64,531	123,543	16,709	20,559
Reference period for the retrospective expenditures	Last 3, 4, 6 and 12 months	Last 3, 6 and 12 months	Last 3, 6 and 12 months	Last 6 and 12 months	Last 4 months	Last 1, 2 and 12 months	Last 7 days, last 1 and 12 months	Last 7 days, last 1 and 12 months
Number of periodic rounds for data collection on foods expenditures	1 (Last 7 days)	1 (Last 15 days)	1 (Last 3 and 7 days)	1 (33 days) in urban areas and 2 (17 days) in rural areas	2 (33 days) in urban areas and 3 (25 days) in rural areas	1 (Last 30 days)	1 (Last 7 days)	1 (Last 7 days)

Sources: Survey Reports and Questionnaires. Note that food expenditures variable was not available in the database of ESAM 1 at our disposal. Panel Survey in Tanzania, cross-section surveys in Cameroon and Senegal. The number of households and individuals as reported here corresponds to the original sample size. They might not be consistent with the number of observations used in the statistical tables due to the treatment of missing observations and restriction to sample of specific groups.

Table 3: Components of the expenditures

	Cameroon			Senegal			Tanzania	
	ECAM 1	ECAM 2	ECAM 3	ESAM 1	ESAM 2	ESPS 1	TZNPS 1	TZNPS 2
Food expenditures								
Tobacco and beverages								
Clothing and shoes								
Housing maintenance								
Water, sanitation, energy for cooking and lighting								
Telephone								
Housing equipment								
Health and personal care								
Transportation and communication								
Education								
Leisure and other services								
Hostels and restaurants								
Ceremonial expenditures								
Jewelry								
Food consumption inside and outside the household								

Source: Survey Questionnaires. The white area indicates that this component was not included in the corresponding survey.

Table 4: FAO's adult equivalent scale

	Male	Female
Less than 1 year	0.27	0.27
1-3	0.45	0.45
4-6	0.61	0.61
7-9	0.73	0.73
10-12	0.86	0.73
13-15	0.96	0.83
16-19	1.02	0.77
20-50	1.00	0.77
More than 50	0.86	0.79

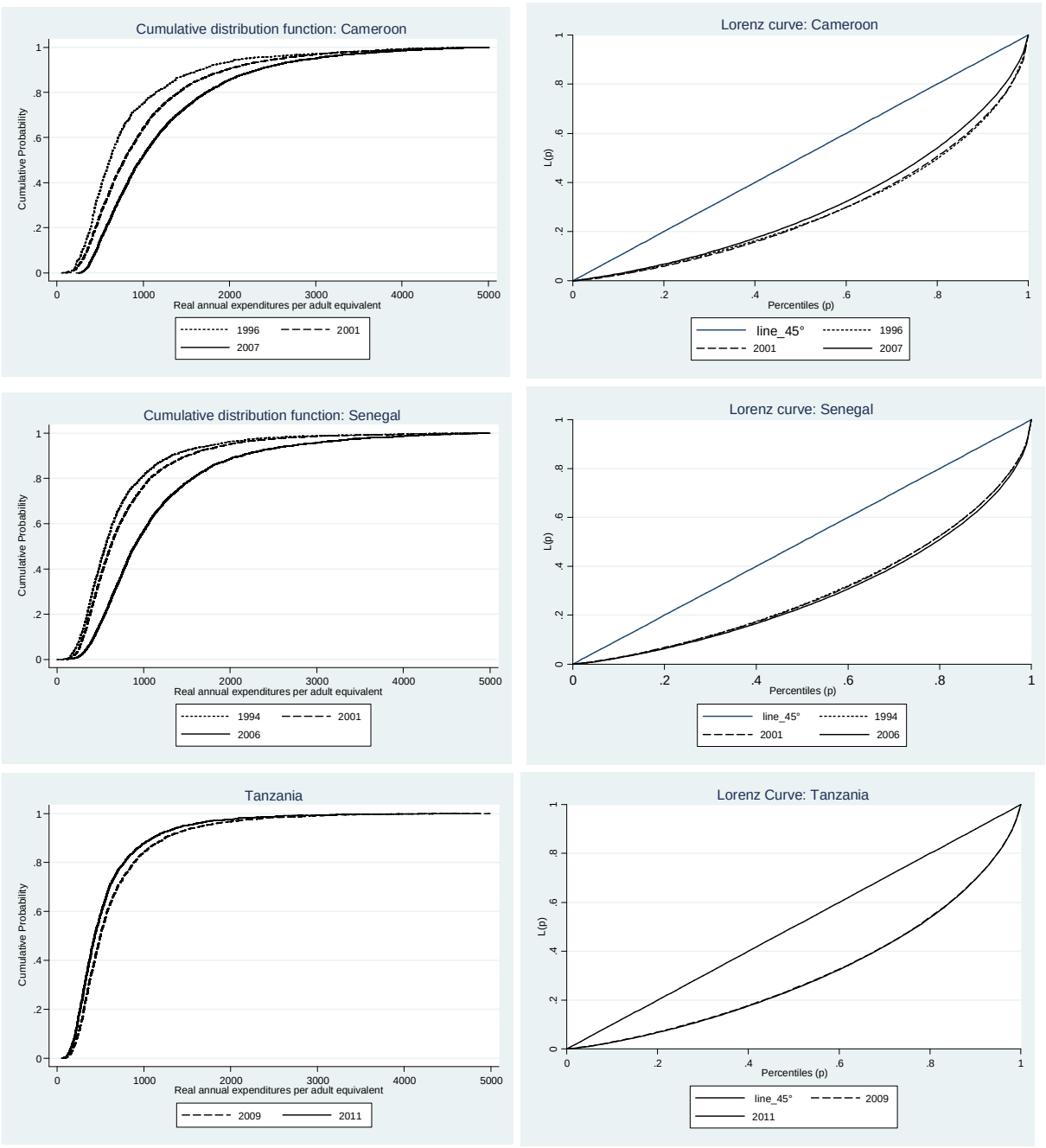
Source: Afristat, Séries Méthodes N°7, 2009, p.32

Table 5: Summary statistics

	Observations	Mean	Std. dev.	Min	Max
Cameroon					
1996	10325	1180.5	1408.1	51.9	25912.3
2001	56927	1259.4	1678.9	64.1	73058.1
2007	51837	1458.3	1308.5	225.3	36327.6
Senegal					
1994	32529	873.0	1024.2	78.6	34946.3
2001	64531	927.2	1193.2	107.5	46523.3
2006	123543	1207.4	1418.3	0.0	87065.3
Tanzania					
2009	16709	762.0	733.5	50.3	9599.6
2011	20227	644.1	598.2	54.5	7476.3
2009*	16709	1190.8	1047.2	87.0	13452.1
2011*	20227	1183.2	1018.8	118.0	14207.1

Real annual consumption expenditures per adult equivalent in constant 2005 US dollars PPP.
(*) for Tanzania stands for the summary statistics on the real expenditures as provided by the national office of statistics.

Figure 3: Evolution of poverty and inequality in Cameroon, Senegal and Tanzania



Cumulative distribution functions (left) and Lorenz curve (right)

Table 6: Econometric results for the parametric estimation of the quasi Na-GIC

	Cameroon			Senegal		
	1996	2001	2007	1994	2001	2006
Year of birth	0.430	-10.15***	-11.41***	-11.30***	-6.196***	-5.722***
	(3.011)	(1.548)	(1.480)	(1.481)	(1.194)	(1.434)
Women	78.15	82.58***	105.7***	65.63***	90.68***	63.87***
	(49.96)	(25.28)	(23.79)	(25.08)	(20.09)	(23.84)
Level of education	382.1***	447.1***	463.1***	532.4***	563.4***	499.2***
	(32.36)	(16.17)	(15.68)	(16.79)	(14.22)	(17.64)
Constant	-39.07	20,683***	23,353***	22,712***	12,798***	12,296***
	(5,883)	(3,025)	(2,891)	(2,894)	(2,333)	(2,802)
Observations	2,755	11,895	8,490	7,950	12,645	20,634
R-squared	0.052	0.061	0.093	0.114	0.111	0.038

The dependant variable is the household's consumption. OLS estimation based on the sample of individuals between 25 and 55 years old at the baseline year of the surveys.

Figure 4: Growth incidence curves for Tanzania using the real consumption provided by the national office of statistics

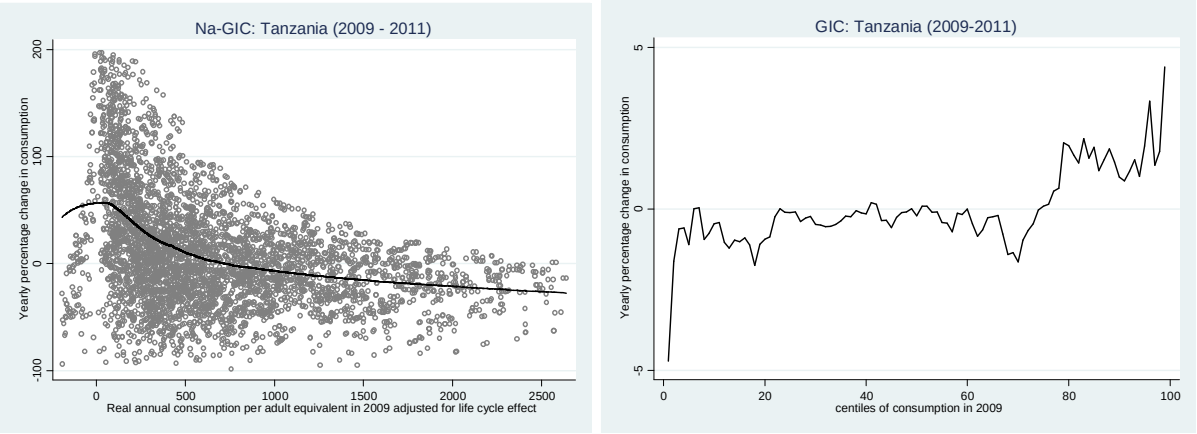


Figure 5: Growth incidence curves from the full samples

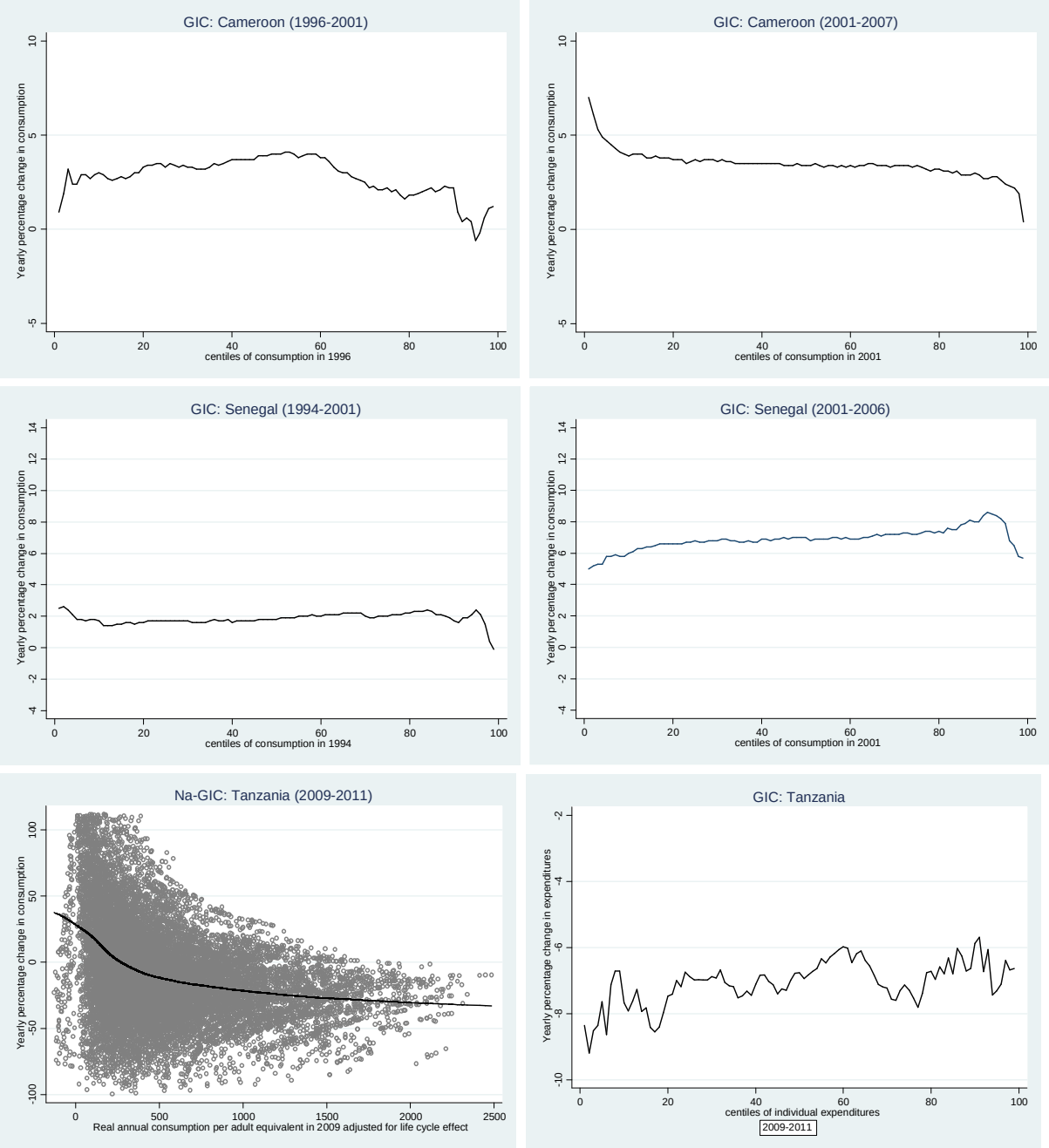


Table 7: Skill intensity in the sectors that contribute more than average to the GDP growth

Cameroon	**1996**	**2001**	**2007**
Agriculture (crops, fisheries, livestock)	12.9	14.6	19.0
Transportation	36.9	55.1	51.8
Trade	31.1	34.2	45.8
Senegal	**1994**	**2001**	**2006**
Transportation and communications	4.2	2.5	2.8
Trade	1.0	1.5	2.0
Construction	3.7	2.4	1.7
Agriculture (crops, forestry, husbandry)	0.5	1.1	1.7
Tanzania		**2009**	**2001**
Agriculture/livestock		2.7	3.5
Public administration		69.9	61.3
Construction, manufacturing, real estate, transportation and communication		21.1	18.6

Percentage of individuals who reached at least the secondary level of education.
Source: Household survey databases