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## **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 the household consumption of individuals 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 growth incidence curve 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. Our methodology finds that 63 per cent of the population in Tanzania live in households whose real consumption expenditures fall during the growth spell.

**Keywords:** inclusive growth, Africa, poverty, inequality

**JEL classification:** O10, O15, O43, O55

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## 1 Introduction

The reduction of poverty and inequality has so far been at the centre-stage of both policy and academic debates all over the world.<sup>1</sup> In Africa in particular, implementing policies that reduce poverty and inequality is not only an issue of fairness, 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).<sup>2</sup>

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 whether some groups benefit more than others and to identify these groups.

We address these questions by relaxing the anonymity principle underlying 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 who share the same time-invariant characteristics. More specifically, we construct groups according to the birth generation, gender and level of education of 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 his 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 live, on average, 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 gross domestic product (GDP) growth. We also find that 63 per cent of the population in Tanzania experience a fall in their household consumption, 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 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 suggestive evidence of the role of education and monetary policies in driving

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<sup>1</sup> See Piketty (2013) and Ravallion (2013).

<sup>2</sup> According to the World Economic Outlook, 2012, the average GDP growth rate in Africa between 2003 and 2012 has been 5.2 per cent. Meanwhile, according to the PovcalNet website, the headcount index dropped from 47 per cent in 2002 to 40 per cent in 2008.

the impact of growth to the well-being of individuals, consistently with the findings by Rahul et al. (2014) in India.

The remainder 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 macroeconomic performance of the selected countries and gives background information on the major public policies that were implemented by these countries. Section 4 describes the dataset with an emphasis on the issue of the comparison of the results across countries and years. Section 5 presents the results and finally section 6 concludes.

## 2 Literature

As reviewed by Ranieri and Almeida 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).

From 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 gender, ethnic and geographic groups differentially, 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 of Grosse et al. (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 all groups and all parts of the society*. Ali and Son (2007) define inclusive growth as growth that increases social opportunities available to all different stripes of the population. For Ianchovichina and Lundstrom (2009), growth is inclusive if it is sustainable in the long run, and if it involves economic diversification and competition as well as being ‘broad-based across sectors, and inclusive of the large part of the country’s labour force’. Along the same lines, Bhalla (2007) emphasizes productive employment along with growth in productivity in existing jobs to constitute the 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 the 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 needed 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, Almeida Ramos et al. (2013) propose 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 apply 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 rely 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 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 the poor more. On the other hand, the growth elasticity of poverty reduction provides the rate of change in the poverty headcount index generated by a 1 per cent increase in GDP growth.

In Cameroon, Senegal and Tanzania, the estimates of the growth elasticity of poverty reduction are between 0.2 and 2.0. 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 between 2001-05 it decreased from 1.55 to 0.7 over the years 2006-11 (Kireyev 2013). The latest estimate of the growth elasticity of poverty reduction is 2 in Tanzania. With regard to the growth incidence curve, it is flat in Cameroon between 1996-2001, and downward sloping between 2001-07 (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 2001-07.

Based on 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 individual 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 this critique even further, 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 some quasi Na-GIC; that is, growth incidence curves that follow the same group of individuals, characterized by their socioeconomic characteristics, over a growth spell. In particular, we draw on Dang and Lanjouw (2013) who demonstrate 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 west African countries whereas Tanzania is located in east Africa. Among the three countries, Cameroon is the richest in terms of gross national income per capita followed by Senegal and Tanzania (see Appendix Figure 2). These three countries have been selected

primarily because of the availability of data relevant for our analysis. Interestingly, each country presents some particular features so that altogether they provide a richer framework for analysing the incidence of growth on well-being in Africa.

Indeed, the three countries recovered from an economic downturn during the first half of the 1990s. However, their growth performance in the aftermath of this crisis was not similar (see Appendix Figure 2). Cameroon performed better than Senegal between 1996 and 2000. The average growth rate of GDP per capita over this period was 2.3 and 1.5 per cent for Cameroon and Senegal, respectively. This outcome was reversed during the next five years. The average GDP per capita growth in Cameroon fell to 1.4 per cent, whereas it rose to 1.9 per cent in Senegal. Unlike Cameroon and Senegal, Tanzania has had a better growth performance. Its average GDP per capita growth rate rose from 1.7 per cent in 1996-2000 to 4 per cent in 2006-10.

According to national account reports, the sectors that contribute the most to the growth performance in Cameroon in order of importance are food crops, fisheries, transportation, and trade. In Senegal, they are, respectively, telecommunications, trade, construction, and food crops. In Tanzania, trade and repairs, food crops, construction, manufacturing, real estate business, public administration, communication and transportation are the major sectors driving the economy.<sup>3</sup> Given the growth performance, the skill intensity of these sectors may help explain the incidence of growth on consumption according to the level of education of the individuals.<sup>4</sup>

Appendix Table 1 presents the major public policies implemented in Cameroon, Senegal and Tanzania between 1994 and 2010. In all three countries, recovery from the economic downturn of the early 1990s was accompanied by a significant shift in public policies, particularly with regard to monetary policy in the aftermath of the crisis, and education and employment policies later (see Appendix Table 1). Indeed, in 1994, Cameroon and Senegal underwent a 50 per cent currency devaluation, as members of the 'Franc CFA' currency union.<sup>5</sup> The main objective of the Central Bank of West African States was price stabilization after a decade of hyperinflation. In addition, the currency union was 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 per cent in Cameroon while it was 32.3 per cent in Senegal in 1994 but quickly dropped, on average, to 2 per cent between 1995 and 2006.<sup>6</sup> On the other hand, Tanzania modernized its central bank through the adoption of the 1995 Bank of

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<sup>3</sup> We selected the sectors where the contribution exceeds the average. In 2007, GDP growth rate in Tanzania was 3.4 per cent where the main sector contributions were: food crops and fisheries (1.2 per cent), transportation (0.7 per cent) and trade (0.4 per cent). This structure is similar to previous years (1996-2006).

The average GDP growth rate in Senegal is 4 per cent. The sectors contributing the most to GDP growth were, respectively, post and telecommunications (0.7 per cent), trade (0.5 per cent), construction (0.3 per cent) and food crops (0.1 per cent).

In Tanzania, the average growth rate was 6.1 per cent between 2009-11. Over this period, the following sectors were major contributors to the economy: trade and repairs (0.94 per cent), crops (i.e., agriculture: 0.80 per cent), construction (0.72 per cent), manufacturing (0.71 per cent), real estate and business (0.60 per cent), public administration (0.50 per cent), communications (0.44 per cent) and transportation (0.35 per cent).

<sup>4</sup> Appendix Table 7 confirms this insight.

<sup>5</sup> Cameroon and Senegal have been members of the CEMAC and UEMOA, respectively, since their independence from France in 1960.

<sup>6</sup> Note that the fluctuation of the inflation rate over this period is larger in Senegal than in Cameroon.

Tanzania Act with a focus on price stabilization. Nevertheless, the average rate of inflation was 10 per cent between 1995 and 2007, which persisted until 2008 but dropped to 6.2 per cent by 2010.

A wave of liberalization and privatization of public utilities has accompanied the recovery from the early 1990s economic downturn. In addition, primary school construction programmes along with reduced registration fees have been implemented since the early 2000s. Furthermore, national health policies to fight HIV/AIDS and malaria have been conducted since the late 1990s.

## 4 Empirical framework

### 4.1 Dataset

This study relies on several rounds of households surveys conducted in Cameroon, Senegal and Tanzania. As shown in Appendix Table 2, 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 as well as the sociodemographic characteristics of individuals such as the year of birth, gender and the level of education (see Appendix Table 1).<sup>7</sup> 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 within 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 Appendix Table 1).

### 4.2 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  $j$* ,  $\pi$  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 Appendix Table 1). In Tanzania the real annual expenditures are 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

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<sup>7</sup> Information on individuals' income is not available in all surveys, and when this is available, it suffers from several missing values.

on real expenditures based on the CPI; but we compare them to the results obtained using real expenditures supplied by the Tanzania's 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.

Another issue is the life-cycle effect that can influence the comparison of an individual's household consumption over time (Guénard 2001). This is because consumption per adult equivalent within a household depends both on the number of contributors and its 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 the two survey waves. This life-cycle effect is strongly linked to the age of the individual. In order to adjust consumption for this effect, we append the dataset from all the different countries and different years. Next we regress consumption expenditures on age and age squared controlling for country- and year-specific effects.

$$Expend_{i,j,kt} = \alpha + \beta_1 age_i + \beta_2 age_i^2 + \gamma country_j + \delta year_t + \varepsilon_{i,j,kt} \quad (1)$$

where  $Expend_{i,j,kt}$ , refers to the real expenditures of household  $j$  in country  $k$  and year  $t$ ,  $age_i$  refers to the age of individual  $i$ ,  $country_j$  is a dummy to indicate the country of residence of individual  $i$ ,  $year_t$  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:

$$adjuExp = a + \gamma country_j + \delta year_t + \varepsilon_{i,j,kt} \quad (2)$$

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

### 4.3 Summary statistics

Appendix Table 5 presents the summary statistics of the consumption expenditures variable. Consistent 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 observation period. More specifically, it rises by 1.3 and 2.5 per cent, respectively, over the periods 1996-2001 and 2001-07 in Cameroon. Likewise, the average annual variation in consumption expenditures is lower (0.8 per cent) over the first period (1994-2001) than over the second period (5.4 per cent between 2001-06). In Tanzania, it falls by an average of 8 per cent between 2009 and 2011.<sup>8</sup>

Appendix 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

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<sup>8</sup> Note that this rate of decrease in consumption expenditures for Tanzania is much lower when we rely on real expenditures as provided by the national statistics office; but still negative (-0.3 per cent).



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 absolute poverty, these outcomes imply that it decreases in Cameroon (1996-2007) and Senegal (1994-2006), but rises in Tanzania over the period 2009-11.<sup>9</sup> These results are complemented by the Lorenz curves on the right panel of the figure. They show that inequality falls in Cameroon more significantly between 2001 and 2007 than during the period 1996-2001. In contrast, it remains almost stable in Senegal between 1994 and 2001, but rises slightly between 2001-06. In Tanzania, there is no change in inequality between 2009-11, as measured by the area between the Lorenz curve and the 45° line.

In addition to these statistics, we also present in the results section the growth incidence curves which show how the average change in consumption expenditures varies with the quantiles of consumption. Together, they provide an overview of the evolution of poverty and inequality in the three countries. However, to the extent that the welfare of individuals depends on their pre- and post-growth income, GICs cannot be used to derive any robust implication with respect to the impact of each growth spell on individual welfare. This is primarily because GICs rely on the anonymity principle. In the following subsection, we present our methodology for assessing the inclusiveness of growth, that is, the extent to which a growth spell has raised the welfare of all individuals in the society.

#### **4.4 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, i.e., which group, 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 measures the yearly percentage change in the quantiles of consumption. It does not focus on the change in welfare of particular individuals but rather assesses the change in the distribution of consumption/income as a whole. By doing so, it abstracts from income mobility, which can be particularly important, especially 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 measure the yearly percentage change in each individual's consumption/revenue. Ideally, its construction is based on panel data which allow tracking the consumption of the same individuals over several years. However, as we have no panel data (except for Tanzania), we rely on the pseudo-panel methodology as implemented by Dang and Lanjouw (2013) 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-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

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<sup>9</sup> This is valid if poverty is measured by the headcount index and the poverty threshold is held fixed.

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 an individual level; but can 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 addition, we are able to build the exact Na-GICs for Tanzania using the panel structure of its dataset.

We estimate the Na-GICs non-parametrically. In particular, the estimation of the quasi Na-GIC relies on three time-invariant characteristics due to the information available from the datasets. These time-invariant characteristics are the year of birth, gender and the highest level of education of individuals between 25 and 55 years old at the baseline of the survey in Cameroon and Senegal.<sup>10</sup> 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 welfare according to the level of education, we complement the non-parametric estimation of the quasi Na-GIC with a parametric one.

#### 4.5 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 consumption expenditures. More formally, let  $r_i$  denote the average annual rate of variation in individual  $i$ 's household consumption  $Y_{it}$  over the period spanning from  $t$  to  $t+T$ ;

$$r_i = \left( \frac{Y_{it+T}}{Y_{it}} \right)^{\frac{1}{T}} - 1 \quad (3)$$

The Na-GIC is the scatter plot of the couples  $(Y_{it}, r_i)$ . In order to trace the general trend in this scatter plot, we implement a locally weighted regression with an optimal bandwidth for the Lowess methodology (see Härdle 1990). This Lowess represents the analogue to the standard GIC when the anonymity principle is relaxed. This approach, applicable to Tanzania, uses all the information available in the data, instead of relying on the centiles 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 the 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, as in the case of 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 six birth generations by aggregating birth cohorts five by five years, from the sample of individuals aged between 25 and 55 years. The number of years of education is transformed

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<sup>10</sup> The baseline of a survey corresponds to the year of the first available survey.

into three levels of education (none, primary and secondary) in order to make this information consistent across all the datasets.<sup>11</sup>

Then we compute the weighted average household consumption of individuals belonging to each group. The consumption is adjusted for the life-cycle effect as presented in section 4.4. The average is computed for each group for all the countries and years. We next 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 surveys, the yearly percentage is estimated as the geometric average over the period between the two surveys:

$$r_g = \left( \frac{Y_{gt+T}}{Y_{gt}} \right)^{\frac{1}{T}} - 1 \quad (4)$$

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

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.

#### 4.6 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:

$$Y_{it} = \alpha_t + \beta X_i + \varepsilon_{it} \quad (5)$$

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 individual  $i$ . Finally,  $\varepsilon_{it}$  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.

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<sup>11</sup> With the exception of the Tanzanian dataset, the information on education is clustered into the level of education.

## 5 Results

By examining three countries (Cameroon, Senegal, and Tanzania) our goal is to assess the inclusiveness of growth in different growth episodes with different types of data (cross-section and panel). For each country, we present the non-parametric estimation of the Na-GIC, stressing 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 non-parametric Na-GIC, according to the time-invariant characteristics, particularly the level of education among individuals aged between 25 and 55 years.

On the graphs presenting of the parametric estimation (cf. the two at the bottom of Figure 1), each scatter plot, for a given gender and level of education, corresponds to the relationship between the birth cohort and the average percentage change in the consumption of the members of the cohorts' households. In order to interpret this relationship, 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 given in **Error! Reference source not found.A6**. 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 older cohorts benefit, on average, more from growth than the younger ones. Regarding the correlation between the other two characteristics (gender and level of education) and the household's consumption, the regression results in **Error! Reference source not found.A6** show that women and more educated individuals live on average in richer households.

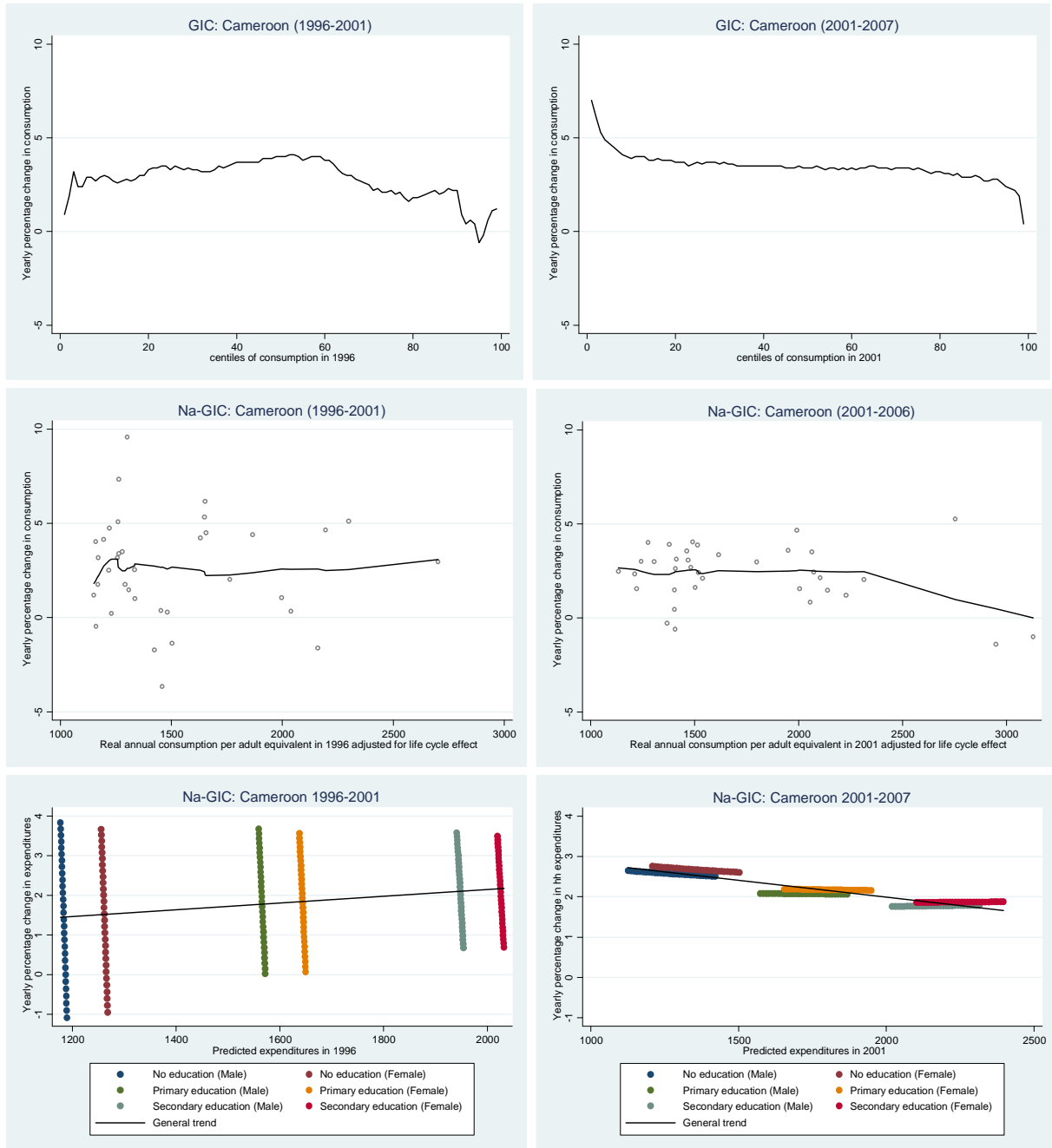
In interpreting the results for Cameroon and Senegal, the word 'group' refers to the 36 groups of individuals defined according to their birth generation, gender and level of education. In both Cameroon and Senegal, the standard GICs suggest that all groups benefit from growth in both periods. This contrasts 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 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 Senegal 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 Figure 1 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 better-educated individuals. The general trend is actually upward sloping. However, there is not much difference between 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 2001-07. In fact, the downward slope of the Na-GIC over this period is mainly driven by the level of education. As presented in Figure 1, for a given level of education, there is no difference in the rate of variation of the consumption of households of the younger versus the older. We observe a small difference in the incidence of growth in favour of women with respect to men. The main difference emerges when we compare the incidence of growth on a household's consumption of individuals with different levels of

education. As shown in the figure, households of the better educated individuals experience lower yearly percentage change in their consumption than those of the less educated.

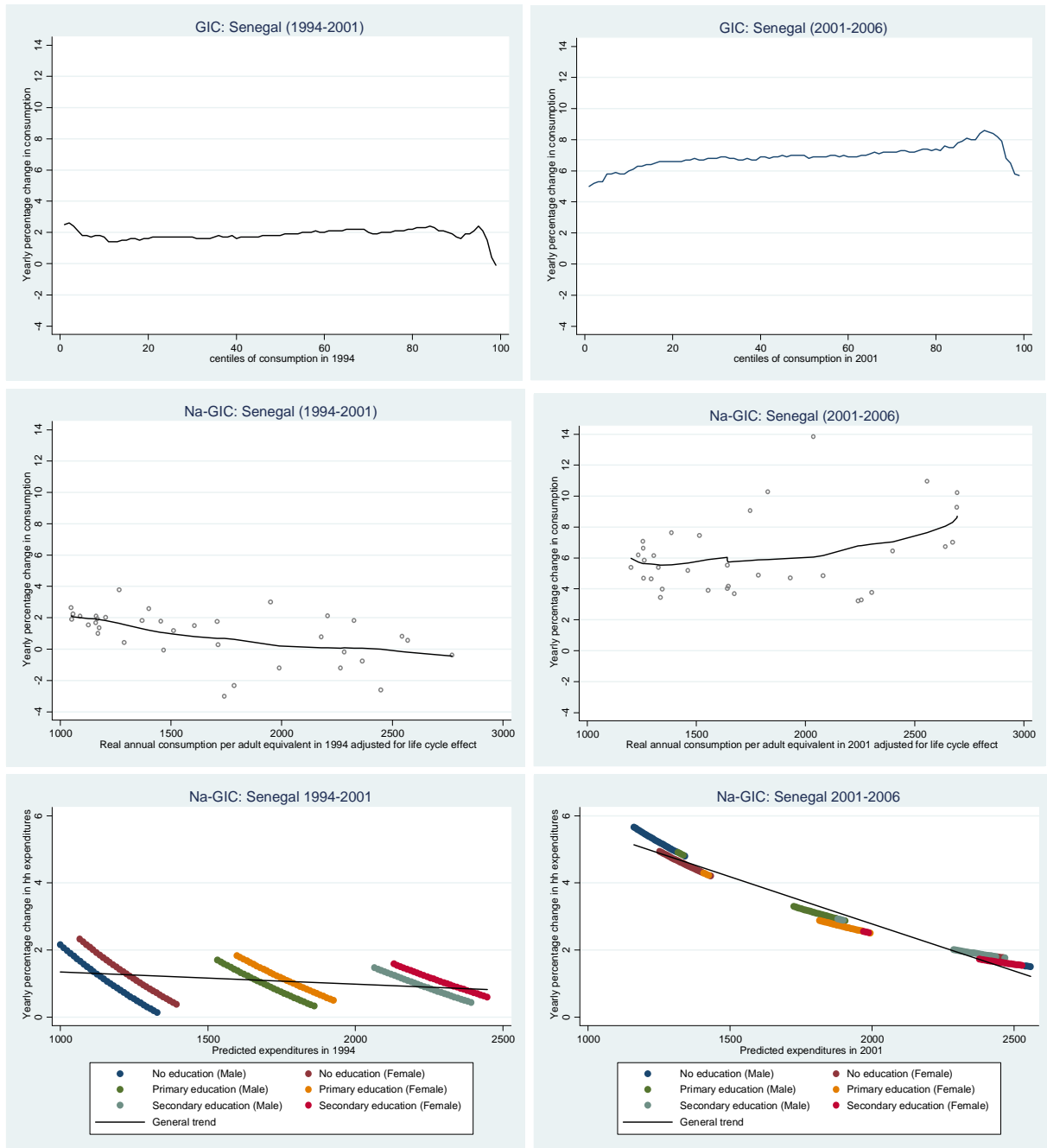
Figure 1: Results for Cameroon



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.

Source: Computed by the authors based on the household surveys data from the national statistical office.

Figure 2: 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.

Source: Computed by the authors based on the household survey data from the national statistical office of Senegal.

Unlike the case of Cameroon, the poorer groups in Senegal benefit more from growth than the richer ones between 1994 and 2001 (Figure 2). The reverse holds true for the period between 2001-06 even though the yearly percentage increase in consumption is almost three times higher over this period, consistently with a higher GDP growth.

As shown in the bottom panels of Figure 2 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, experienced a higher increase in the consumption of their households than older cohorts. This is true irrespective of gender or the level of education of the individual. There is no difference between women and men. However, less educated individuals, who generally live in poorer households, benefited more from growth than the better educated ones. It is harder to disentangle the driver of the profile of the Na-GIC in Senegal between 2001-06 because of the opposite slope yielded by the parametric and the non-parametric approaches. Nevertheless, it stands out clearly that the less educated individuals, who generally live in poorer households, experienced a larger increase in their household consumption over this period than better educated individuals.

The results from Tanzania (Figure 3) highlight how misleading the standard GIC might be. As shown in the figure, the standard GIC suggests that almost every group in the society 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 statistics office (see Appendix Figure 4).

Two additional results stand out from these figures. First, in spite of an average 3.4 per cent growth in GDP per capita between 2009 and 2011, more than half of the population (63 per cent) have experienced a fall in their household consumption. In addition, 62 per cent of the Tanzanian population live in households where consumption increased less than the average yearly percentage change, which is -1.1 per cent.<sup>12</sup> This massive fall in real consumption is associated with the high rate of inflation. As a matter of fact, the CPI went from 142 in 2009 to 170 in 2011.<sup>13</sup> This was not the case in Cameroon and Senegal where the rate of inflation was held below 3 per cent 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 large variations in its consumption.

The same patterns are observed when the sample is split according to the highest level of education achieved by individuals aged between 25 and 55 years in 2009. However, contrary to the results in Cameroon and Senegal, more educated individuals tend to benefit more from growth than the less educated ones. In fact, 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 most prominently contribute to GDP growth in Tanzanian economy (see Appendix Table 7).

In order to check the validity of the quasi Na-GIC in Cameroon and Senegal, we present the results of its parametric estimation for Tanzania (see the bottom right of Figure 3). It turns out that it shares the same downward sloping profile as the actual Na-GIC. This result suggests that the shape of the

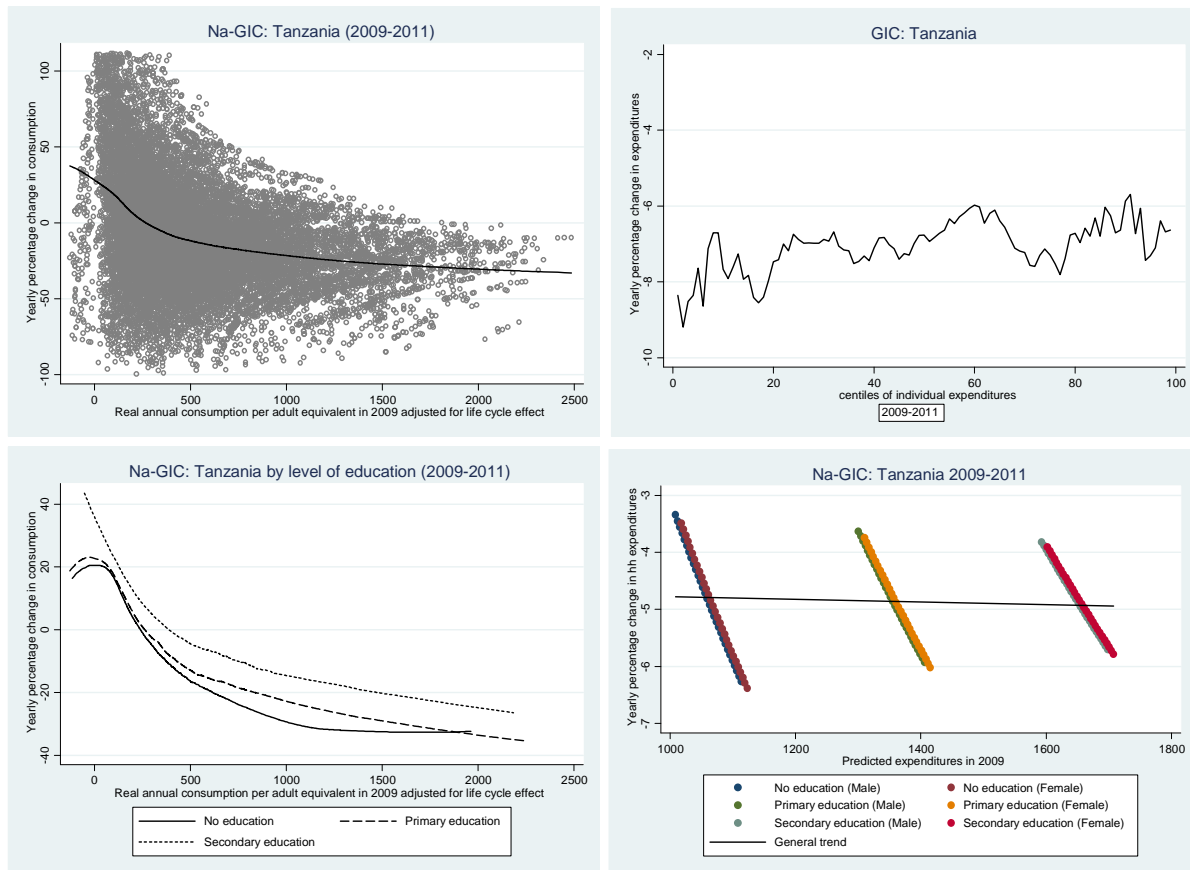
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<sup>12</sup> These figures are, respectively, 52 and 66 per cent when we use data on real expenditures provided by the national statistics office.

<sup>13</sup> Unlike the price index used by the state statistics office, the World Bank's CPI does not account for heterogeneity in the rate of inflation across regions and months of the survey.

quasi Na-GIC obtained in Cameroon and Senegal approximates well the real shape of the Na-GIC, should we track the same individuals over the different growth spells in these countries.

Figure 3: 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.

Source: Computed by the authors based on the household surveys data from the national statistical office of Tanzania.

## 6 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 data for Cameroon and Senegal, we track the consumption of groups of individuals who share 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 a growth process. This is consistent with the findings by Grimm (2007) for Peru and Indonesia. Second, the more educated individuals are not necessarily those who benefit from growth, except in Tanzania where growth is driven by 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 analysed. In fact, 63 per cent of the population live in households whose consumption falls during a growth spell. These results accord well with the conclusion by Rahul et al. (2014) for India.

In terms of policy implications, our results suggest that better educated individuals are not necessarily those who benefit from growth. Whether they benefit more from growth depends on the sectors driving economic growth. In addition, inflation can inhibit the growth benefit, as in the case of Tanzania. Finally, there seems to be higher variance in the fortunes of the poorer both in Tanzania and Senegal, suggesting that they may be more at risk than the rich.

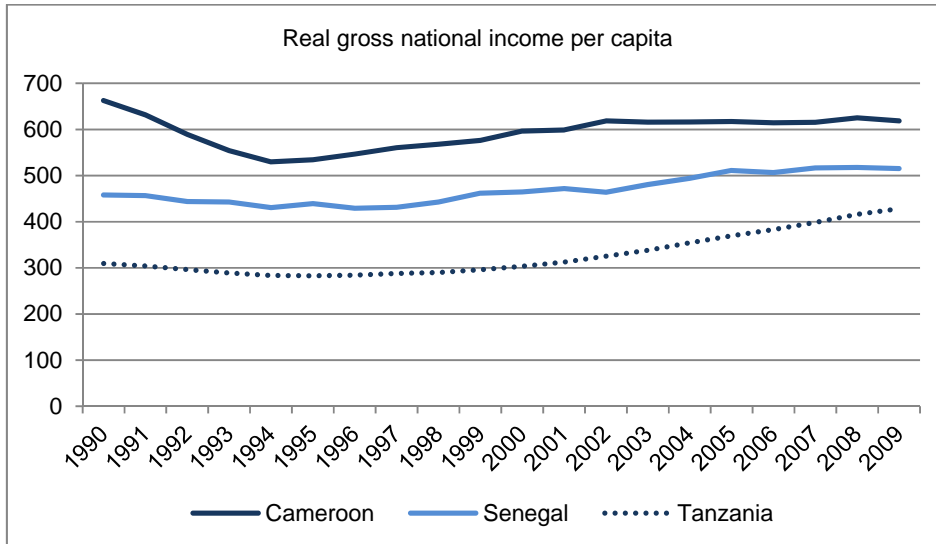
While this study describes the incidence of growth on individuals' consumption across countries and over different periods, it does not say anything about the welfare comparison across the different non-anonymous growth incidence curve. One could use the dominance criteria provided by Bourguignon (2011) 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 these are 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 as in the case of Tanzania could provide a better long-term view of the incidence of growth on individuals' well-being.

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

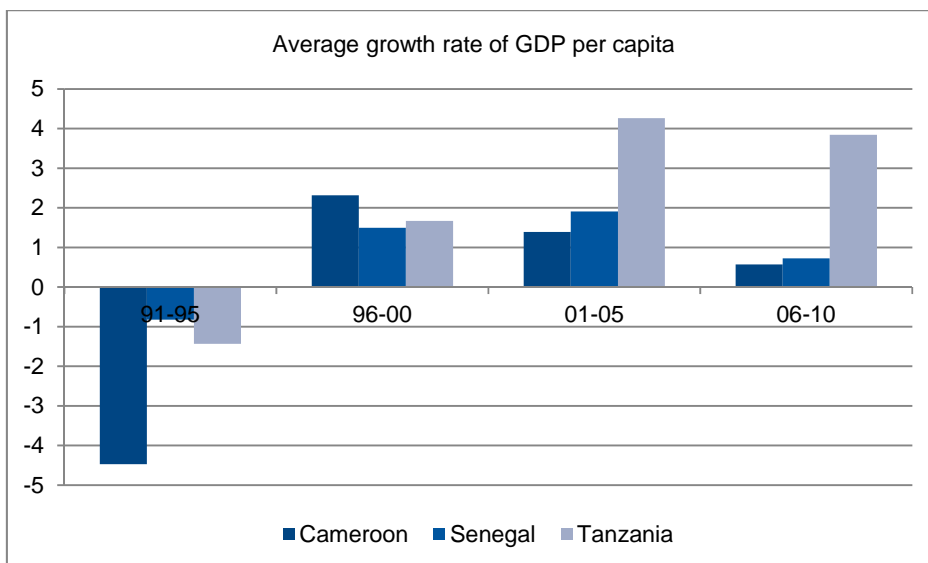
## Appendix

Appendix Figure 1: Gross national income per capita (in constant 2005 US\$ PPP): Cameroon, Senegal and Tanzania



Source: African Development Indicators database provided by the World Bank.

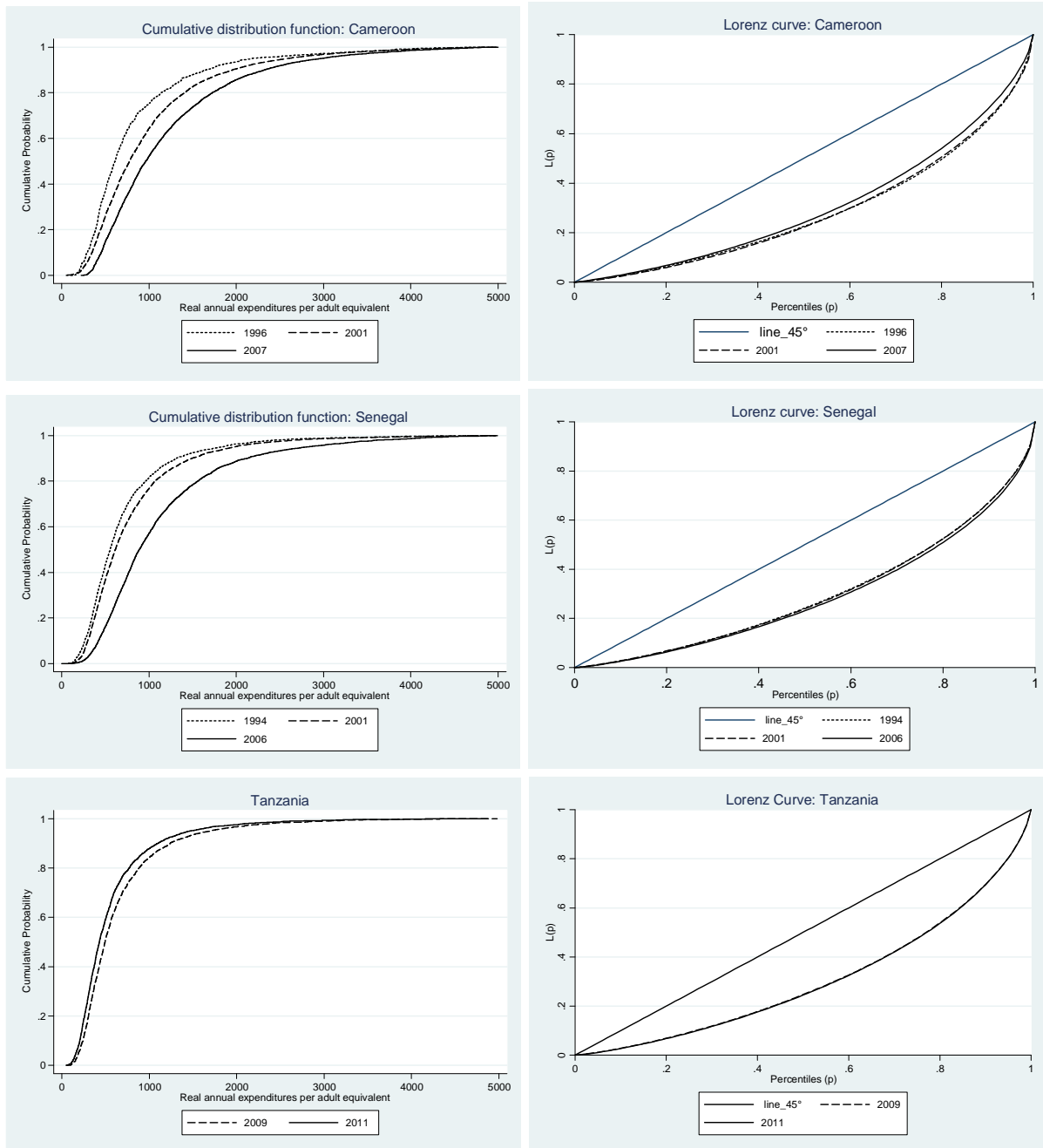
Appendix Figure 2: Growth rate of the GDP per capita



Note: GDP and GNI are in constant 2000 US dollars. 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 2006-09 as an estimate for 2010. All figures are in percentages.

Data source: African Development Indicators from the World Bank (December 2013).

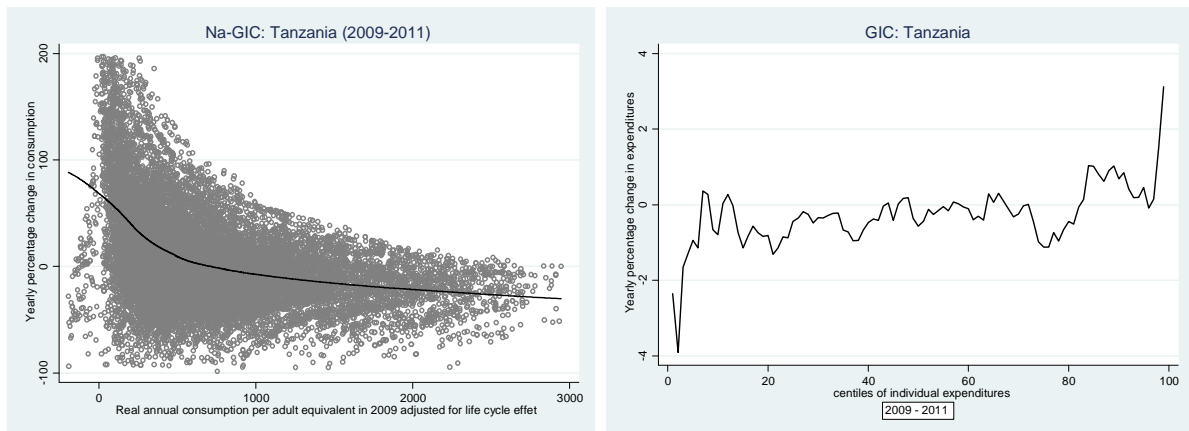
Appendix Figure 3: Evolution of poverty and inequality in Cameroon, Senegal and Tanzania



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

Source: Authors' calculation based on the households survey data from the national statistical offices of Cameroon, Senegal and Tanzania.

Appendix Figure 4: Growth incidence curves for Tanzania using real consumption data



Source: Authors' calculation based on the households survey data from the national statistical office of Tanzania.

Appendix Table 1: Major public policies implemented in the three countries

Major policies	Cameroon	Senegal	Tanzania
Monetary	1994: Devaluation of the common currency Focus on price stabilization		1995: Bank of Tanzania Act. Focus on the single objective of price stability.
Fiscal	1994: 50 per cent cut in public spending (public servants' salaries) 1998: Cancellation of export taxes in July 1999: Introduction of VAT 2004: Progressive rate for income tax	1994: Adjustment and reform programme Budgetary consolidation strategy based on reduction in public spending	2004: Income Tax Act Enlarging the tax base and adapting to globalization
Infrastructure	1997-99: Privatization of rail and air transports 2000: Construction of the Chad-Cameroon pipeline	2003: 25-year concession granted to Transrail S.A. (railway company) 2005-13: Construction of the Dakar-Diamniadio highway	Process of liberalization and privatization of the national infrastructure companies Phase 1: 1993-99. Concerned small manufacturing and service oriented parastatals Phase 2: 2001-04. Big enterprises in telecom, transport, energy and mineral, water and finance system
Education	2000: Registration to primary school free	2001-10: Decennial programme for education and training 2004: Programme of skills development for youth and adults (EQJA)	1995: Education and training policy 1996: Community development policy 1996: Child development policy 1996: Higher education policy 1996: Technical education and training policy 1997: Education sector development programme, revised in 2001 and 2008
Health	2003-12: Enfant VIH/sida (EVS) 2001-11: SSSC	1995: National programme to fight malaria 1998-2007: Programme national de developpement sanitaire et social	1990: National health policy, updated in 2003 and 2007

Sources: Compiled by the authors from the Policy Reports of each respective country.

Appendix 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							
No. of households	1,731	10,992	11,391	3,277	6,594	13,565	3,265	3,924
No. 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
No. of periodic rounds for data collection on food 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)

Note: Food expenditures variable was not available in the ESAM 1 database 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 may not be consistent with the number of observations given in the statistical tables due to the treatment of missing observations and restriction to sample of specific groups.

Source: Compiled by the authors based on survey reports and questionnaires.

Appendix Table 3: Components of household 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/lighting								
Telephone								
Housing equipment								
Health and personal care								
Transportation/communication								
Education								
Leisure and other services								
Hostels and restaurants								
Ceremonial expenditures								
Jewellery								
Food consumption inside/outside the household								

Note: The grey area indicates that this component was not included in the corresponding survey.

Source: Compiled by the authors based on the survey questionnaires.

Appendix 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 (2009: 32).

Appendix Table 5: Summary statistics

		Observations	Mean	Std dev.	Min	Max
Cameroon	1996	10,325	1180.5	1408.1	51.9	25912.3
	2001	56,927	1259.4	1678.9	64.1	73058.1
	2007	51,837	1458.3	1308.5	225.3	36327.6
Senegal	1994	32,529	873.0	1024.2	78.6	34946.3
	2001	64,531	927.2	1193.2	107.5	46523.3
	2006	123,543	1207.4	1418.3	0.0	87065.3
Tanzania	2009	16,709	762.0	733.5	50.3	9599.6
	2011	20,227	644.1	598.2	54.5	7476.3
	2009*	16,709	1190.8	1047.2	87.0	13452.1
	2011*	20,227	1183.2	1018.8	118.0	14207.1

Note: Real annual consumption expenditures per adult equivalent in constant 2005 US\$ PPP. (\*) for Tanzania stands for summary statistics on real expenditures as provided by each national statistics office.

Appendix 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 (3.011)	-10.15*** (1.548)	-11.41*** (1.480)	-11.30*** (1.481)	-6.196*** (1.194)	-5.722*** (1.434)
Women	78.15 (49.96)	82.58*** (25.28)	105.7*** (23.79)	65.63*** (25.08)	90.68*** (20.09)	63.87*** (23.84)
Level of education	382.1*** (32.36)	447.1*** (16.17)	463.1*** (15.68)	532.4*** (16.79)	563.4*** (14.22)	499.2*** (17.64)
Constant	-39.07 (5,883)	20,683*** (3,025)	23,353*** (2,891)	22,712*** (2,894)	12,798*** (2,333)	12,296*** (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

Note: 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.

Source: Authors' calculation based on the households survey data from the national statistical offices of Cameroon, Senegal and Tanzania.

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

Note: Percentage of individuals who reached at least the secondary level of education.

Source: Authors' calculation based on the households survey data from the national statistical offices of Cameroon, Senegal and Tanzania.



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