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Income inequality in Africa, 1990–2019: Measurement, patterns, determinants

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ABSTRACT

This article estimates the evolution of income inequality in Africa from 1990 to 2019 by combining surveys, tax data, and national accounts. Inequality in Africa is very high: the regional top 10% income share nears 55%, on par with regions characterized by extreme inequality, such as Latin America and India. Most of continent-wide income inequality comes from the within-country component rather than from average income differences between countries. Inequality is highest in Southern Africa and lowest in Northern and Western Africa. It remained fairly stable from 1990 to 2019, with the exception of Southern Africa, where it increased significantly. Among historical determinants, this geographical pattern seems to reveal the long shadow of settler colonialism, at least in Sub-Saharan Africa; the spread of Islam stands out as another robust correlate. The poor quality of the raw data calls for great caution, in particular when analyzing country-level dynamics.

1. Introduction

Despite strong economic growth in many African countries during the last decades, human development and poverty indicators have not improved as expected. Indeed, reports by the World Bank on the attainment of Millennium Development Goal targets have shown that poverty has been decreasing in all regions of the world with the exception of the African continent (World Bank, 2015). This stands in contrast with statistics showing that African countries have enjoyed a significant resurgence in growth since the mid-1990s (Fosu, 2015). Solving this puzzle has fueled an interest in the study of inequality as one of the potential factors driving the weak poverty-reduction elasticity of growth in Africa (Fosu, 2009; Thorbecke, 2013).

Is Africa a high-inequality region? Given its high and persistent poverty levels, as well as its expected position in a worldwide Kuznets curve, poverty has long been the main focus of global development and research efforts in Africa (Barrett et al., 2006). Even if the Kuznets curve is no longer considered as a well-grounded empirical regularity, African inequality levels remain debated.[1] Analyses are typically made on the basis of household surveys, which provide a rich set of socioeconomic information but also have several important limitations when it comes to comparing income inequality levels across countries. From one country to another, studies using household surveys may inform on different types of welfare concepts (e.g., disposable income, taxable income, or consumption) and may use different ranking concepts (individuals, households, or other equivalence scales). Moving from one concept to another is likely to significantly modify the income distribution in a country and the estimated level of inequality. As a consequence, when studying inequality across countries or regions, it is key to compare distributions using consistent concepts and methodologies. In addition, household surveys tend to misreport top incomes due to both sampling and non-sampling errors, which typically leads to underestimating inequality. Average income or consumption levels reported in surveys are also often at odds with values reported in the national accounts. As a result, relying only on household surveys to compare inequality levels between Africa and other regions may lead to inaccurate estimates and conclusions (Alvaredo et al., 2016).

A combination of sources is likely to provide a better approximation of Africa's true inequality levels and how it compares to other regions. Combining sources is preferable, for all sources have their own and specific drawbacks. Yet, this is a challenging task and it should be performed with care and transparency, as many issues remain imperfectly addressed (Ravallion, 2022). This paper makes a first attempt in that direction by putting together surveys, tax data, and national accounts in a systematic manner to estimate

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[1] According to Bhorat and Naidoo (2017), the average Gini coefficient in Africa, based on household surveys, is 0.43 in 2014, whereas it is 0.39 in the rest of the developing world. However, heterogeneity is high across countries, and this high average level is driven by seven highly unequal countries with a Gini above 0.55, located mostly in Southern Africa: Angola, the Central African Republic, Botswana, Zambia, Namibia, Comoros, and South Africa. In terms of trends, the reported average African Gini has declined (it was 0.48 in the early 1990s), but this fall is largely due to trends in relatively low-inequality countries.

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the present level of pretax income inequality in the continent, and more tentatively its evolution from 1990 to 2019. Our main finding is that Africa stands out as a region of extreme income inequality by international standards: with a top 10% income share of 55% and a bottom 50% share below 10%, Africa exhibits the highest gap between average incomes of the top 10% and bottom 50% (Fig. 1). This overall high inequality level masks relatively large regional variations. These can in part be explained by historical determinants such as settler colonialism, postcolonial land reforms and socialist policies, and also potentially the influence of Islam. They might also reflect more proximate differences in productivity and employment in the agriculture and service sectors. We hope future research will be better able to disentangle the exact weight played by these different factors in accounting for the very high levels of African inequality.

The rest of the paper is organized as follows. Section 2 provides a brief overview of the literature on the distribution of income in Africa. Section 3 develops and implements a simple statistical method for combining (noisy) household survey data with (scarce) income tax data and (imperfect) national accounts. Section 4 exploits these new estimates to compare inequality in Africa to the rest of the world, explore historical correlates of African inequality, and discuss the link between redistribution policies and inequality.

2. Related Literature on Income Inequality and Growth in Africa

Research on the drivers of inequality in African countries is hindered by the lack of good-quality data, both on the distribution of living standards and on other economic or social indicators, but a few potential lines of explanation have been investigated.

A first strand of the literature has explored the link between the so-called "sub-optimal" structural transformation of the vast majority of African countries and inequality (Cornia, 2017; Cornia, 2019). In theory, the growth of labor-intensive sectors, such as manufacturing or labor-intensive service activities should boost wage employment and thus reduce income inequality (Bhorat and Naidoo, 2017). Yet, unlike Europe during the Industrial Revolution or East Asia more recently, African economies did not experience a gradual shift from agriculture to manufacturing. Instead, the decline of the share of agriculture in GDP went to mining industries and to services.[2] As a result, the decrease in agricultural employment was entirely absorbed in services or in urban unemployment, as mining industries are very capital-intensive. Polarization of the service sector increased because of the development of informal activities, with very poor working conditions and low incomes. This led to a gradual "urbanization of poverty", as informal employment and urban unemployment spread (Ravallion et al., 2007). This pattern is also consistent with the "urbanization without growth" documented by Fay and Opal (2000) in the late 20th century and by Jedwab and Vollrath (2015) in historical perspective. However, the urban–rural gap did not decrease significantly, because of the persistent urban bias in public spending, and because skilled urban residents were more able to exploit the opportunities brought about by liberalization, in particular cheaper food products. Besides, inequalities increased within the rural and within the urban sectors even when they decreased between sectors (Cornia, 2017).

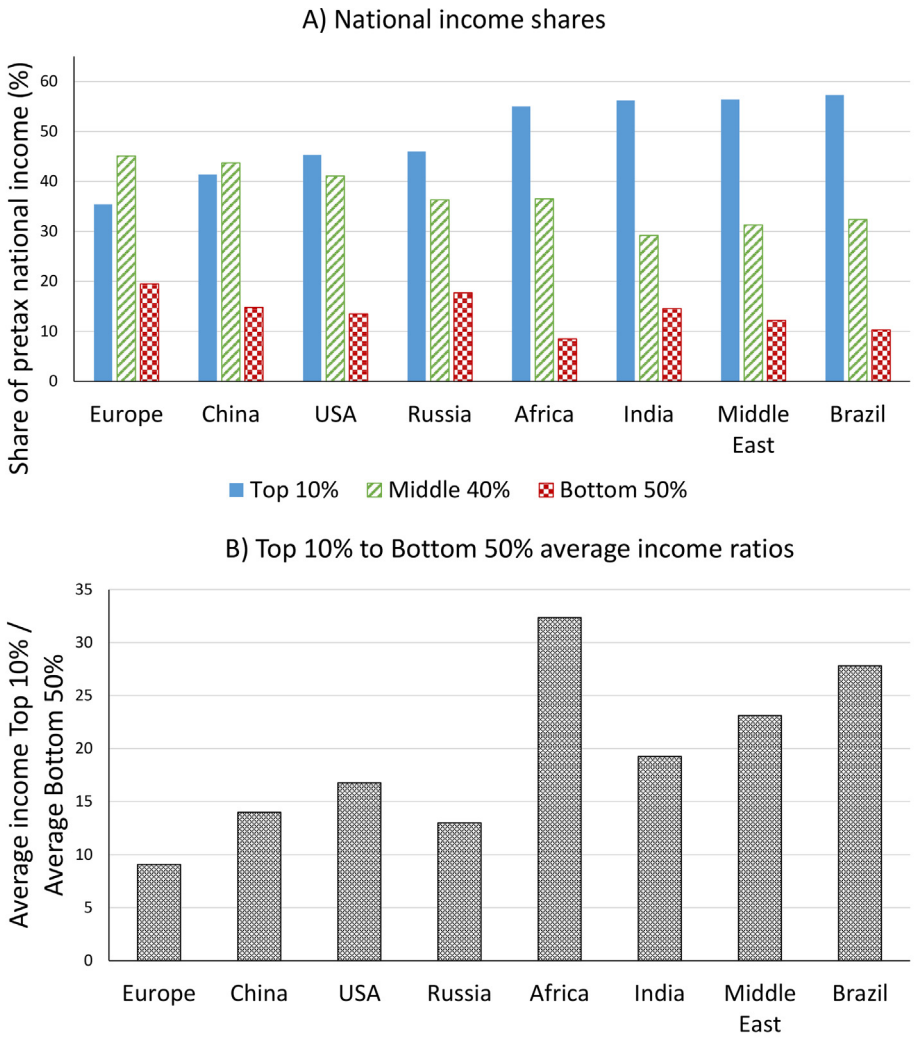
The impact of African growth patterns on income inequality has been studied by looking at the joint evolution of sectoral value-added shares and Gini coefficients (Cornia, 2017). Gini coefficients fell in countries where the value-added share of modern agriculture, labor-intensive manufacturing, and modern services stagnated or rose (for example in Ethiopia, Cameroon, Madagascar); it increased in countries with stagnating land yields, a decline of manufacturing sectors, a rise in the resource enclave and skill-intensive services, and urban informalization.

Focusing on agriculture, a strand of the literature argues that raising agricultural productivity could reduce inequality through increased rural incomes and the diversification of rural activities towards non-agricultural activities, thus favoring industrialization (Gollin, 2010; Pingali, 2010; Estudillo and Otsuka, 2010). Accordingly, a series of empirical papers underline the role of agricultural modernization in triggering growth, development, and reducing poverty and inequality (Bourguignon and Morrisson, 1998; Christiaensen et al., 2011; Imai and Gaiha, 2014). This can be particularly relevant for Africa, which has not fully completed its agricultural transition yet. Yet, some authors underline that agricultural modernization has more impact on poverty than on inequality (Herault and Thurlow, 2009; Imai et al., 2016). Some also stress that equal land distribution is key to enabling agriculture to reduce both poverty and inequality (Griffin et al., 2002; Christiaensen et al., 2011; Manji, 2006). Furthermore, although there are few economies of scale in agricultural production, these can be very important in the transport sector, especially for the international transport of agricultural products. Then, the exploitation of these rents can go hand in hand with increasing inequalities.

The influence of extractive industries on inequality has often been pointed out. In theory, extractive industries fuel income inequality, both through economic and institutional channels. According to Bhorat et al. (2017), extractive industries are characterized by high capital intensity and limited employment creation, and mainly for skilled labor. Besides, the high cost of entry leads to monopolistic or oligopolistic market structures that favor high pricing and profits. A boom in the resource price can lead to the appreciation of the local currency, which can then disadvantage employment-intensive and often export-reliant sectors, or attract the best workers, draining them from the other sectors (the so-called "Dutch disease"). Extractive industries can also lead to the crowding out of non-resource investment (Papyrakis et al., 2004), or hamper financial sector growth (Isham et al., 2003), and tend to fuel urbanization without industrialization, by sustaining the existence of "consumption cities" (Gollin et al., 2016).

The links between institutions, public policies, and inequality have also been explored in the literature. Colonial legacy is a central issue in this regard (Walle and van de Walle, 2009). Under colonial rule, a minority of settlers held a very large fraction of wealth and positioned themselves at the top of the income distribution (Alvaredo et al., 2021). High wages were paid in a small formal sector formed by colonial administrations and a few companies specializing in the trade of natural resource exports (Cogneau et al., 2021). This dualistic structure partly survived after independence and settlers' departure, giving rise to an "oligarchic bourgeoisie." By comparing five countries using carefully harmonized household survey data, Cogneau et al. (2007) find that income dualism between agriculture and other sectors explains much of cross-country differences in inequality; dualism is higher in the three former French colonies of Côte d'Ivoire, Guinea, and Madagascar than in the two former British colonies of Ghana and Uganda; using the same data, Bossuroy and Cogneau (2013) show that intergenerational mobility between agriculture and other sectors is also lower in the former French colonies, due to higher employment dualism and the concentration of non-agricultural activities in large cities. Denis (2007) argues that the decentralized management of colonial empires also produced large spatial inequalities, and Roessler et al. (2022) show that colonial investments in some cash crop producing areas have left a long-lasting imprint.

[2] McMillan et al. (2014) estimated that structural change in Africa between 1990 and 2005 made a negative contribution to overall economic growth of 1.3% per year on average.



Source: Authors' computations based on WID.world (2021) and own estimates. Distribution of pretax income per adult.

Fig. 1. Inequality Levels Across World Regions, 2019.

In terms of redistribution policies, Odusola (2017) shows that the fiscal space has been increasing over time in part due to an increase in the tax-to-GDP ratio. Institutions played a significant role in this increase: the Open Budget Index is highly correlated with fiscal space, which was also boosted by debt relief.[3] However, fiscal space in Africa remains low compared to the rest of the developing world, and, despite recent improvements in domestic taxation, in many countries tax revenue remains highly dependent on mineral extraction (Cogneau et al., 2021). Further, the distributional effectiveness of fiscal policy remains highly questionable in most countries. Indeed, Odusola (2017) shows that the difference between the gross Gini (before taxes and transfers) and the net Gini (after taxes and transfers) has declined in most countries, which implies that the efficiency of tax-and-transfer systems has also decreased.

According to Bhorat et al. (2017), there has been a general increase in social protection expenditure, but social protection coverage, quality and level of assistance remain critical issues. The expenditure increase is more pronounced in Southern African countries, is variable across countries and does not appear to be correlated with economic growth. Current social protection expenditure is highly related to the quality of democratic governance (as captured by the Mo Ibrahim Index) and to resource dependence (non-resource dependent countries spend more on average).[4]

The comprehensive review of social protection in Africa by the African Development Bank (2011) has shown the positive impact of many specific transfer programs on poverty and inequality reduction, suggesting that social protection can be a key driver of inequality reduction. Bhorat et al. (2017) look at the correlation between inequality reduction (measured by the difference between pre-transfer and post-transfer Gini coefficients) and various characteristics of social protection. They find no clear impact of public social spending on inequality, but a positive impact of both pro-poor coverage of social protection and transfer average amount on inequality reduction.

Regarding educational inequalities, the quality of education is still low, despite significant progress in primary schooling enrolment (Bold et al., 2017; Bhorat and Naidoo, 2017). In addition, except in some Southern and Northern African countries, progresses of secondary education have been slow, and important

[3] The Open Budget Index is issued from the Open Budget Survey, which measures budget transparency, participation, and oversight.

[4] The Ibrahim Index of African Governance (IIAG) score aggregates four categories: safety and rule of law, participation and human rights, sustainable economic opportunity, and human development (Mo Ibrahim Foundation, 2014).

enrolment differentials by income groups persist. This fosters high wage premiums for a few skilled workers in some occupations, which fuels income inequality.

3. Data and Methodology

In this section, we present the data sources used to estimate income inequality in Africa and our methodology to combine them. Section 3.1 presents our data sources. Section 3.2 describes the method used to convert consumption inequality estimates into income inequality estimates. Section 3.3 explains how we correct for under-representation of top incomes in surveys. Section 3.4 outlines how we reconcile our results with national accounts.

3.1. Data Sources

3.1.1. Survey Data

Our primary data source consists in survey tabulations from the World Bank, which are made publicly available on the PovcalNet website.[5] These tabulations provide information on the distribution of consumption per capita. We use Generalized Pareto Interpolation (Blanchet et al., 2017) to harmonize these tabulations and estimate the distribution of consumption by percentile.[6] We complete our database with eight surveys from Côte d'Ivoire, which have been used by Czajka (2017) for his study on the evolution of income inequality in the country since the mid-1980s.[7] Finally, we use additional surveys conducted in Ghana (1988, 1998), Guinea (1994), Madagascar (1993), and Uganda (1992), which were compiled by Cogneau et al. (2007) and are especially useful to model the relationship between consumption inequality and income inequality. We also exploit surveys available from Jenmana (2018) for Thailand (2001–2016) and from Chancel and Piketty (2017) for India (2005, 2011), to have a broader perspective on the joint distribution of income and consumption.

Fig. 2 shows that there are large variations in data coverage across African countries. In Morocco, Nigeria and Madagascar, surveys have been more or less conducted on a regular basis since the early 1980s. In central African countries, by contrast, only one or two surveys are available, in general after 2000. Overall, if we pool together all surveys in our dataset and interpolate between years, we are able to cover about 60% of the continental population in the early 1990s, and 80–90% from 2000 onward.[8]

3.1.2. Tax Data

In contrast to developed countries, where tax data can be used to correct for the under-representation of top incomes in a number of countries (Alvaredo et al., 2018), publicly available tax tabulations are close to non-existent in Africa. We use South African tax tabulations covering the 2002–2014 period provided by Alvaredo and Atkinson (2010) and updates, as well as a similar tabulation covering the formal sector in 2014 Côte d'Ivoire available from Czajka (2017), to study to what extent accounting for the "missing rich" affects income inequality estimates. We also extend our analysis to other developing countries using Thai and Indian tax tabulations provided by Jenmana (2018) and Chancel and Piketty (2017). Given the lack of income tax data in most African countries, we make strong but transparent assumptions in order to correct survey data on the basis of comparable countries where both tax and survey data are available. As additional tax data becomes available, our series can be updated accordingly. In the meantime, given that top-end corrections have a comparable and sizable magnitude in most countries, we feel that it is more adequate to apply a simple and transparent correction method to countries with missing tax data than to make no correction at all.

3.1.3. National Accounts

We account for inequalities between African countries by using macroeconomic series available from the World Inequality Database[9], which cover the 1950–2017 period. These series were constructed by Blanchet and Chancel(2016) by combining various historical data sources. In line with the Distributional National Accounts methodology (Alvaredo et al., 2016), which aims to provide income inequality estimates that are consistent with macroeconomic growth rates, we use these series to scale our country-level inequality estimates to the national income per adult at purchasing power parity.

3.2. From Survey Consumption to Survey Income

The first issue with available inequality statistics in Africa is that they rely almost exclusively on consumption. This makes systematic comparisons between developed and developing countries difficult, since inequality is most often measured in terms of pretax or posttax income in the former. From a theoretical perspective, income inequality is expected to be higher than consumption inequality, as (i) high-income earners tend to save more than poorer individuals (ii) income has a transient component that some households are able to smooth in order to maintain a stable level of consumption and (iii) income is often less accurately measured than consumption and measurement error can inflate inequality. The consumption-income gap is likely to be large at the bottom of the distribution, where the proportion of households incurring transient negative income shocks and with mismeasured incomes is generally higher. It is also likely to be important at the top of the distribution, since the very rich tend to save a large proportion of their current earnings, benefit from large transient positive income shocks such as capital gains, and underreport their income in surveys. Yet, very little is known on how income-consumption profiles vary across countries and across time.

Our primary objective is to make estimates of the distributions of consumption and income comparable. Accordingly, if we know to what extent consumption is higher or lower than income at all points of a given distribution, we can use this relationship to "transform" consumption distributions into income distributions (Blanchet et al., 2022). In other words, our aim is to model income-consumption profiles $c_1(.)$ of the form:

$$c_1(p) = \frac{Q^I(p)}{Q^C(p)}$$

Where $Q^I(.)$ is the quantile function associated with a given distribution of income, $Q^C(.)$ is the quantile function associated with a given distribution of consumption, and $p \in [0, 1]$.

We start by estimating the empirical shape of $c_1(p)$ for countries and years for which we have reliable survey data on both survey pretax income and consumption. Following our definition of $c_1(p)$, computing income-consumption ratios is straightforward:

[5] http://iresearch.worldbank.org/PovcalNet/povOnDemand.aspx.

[6] The objective of this interpolation technique is to produce a "smooth" distribution starting from either tabulated income tax data or non-exhaustive individual data, as is typically available from survey tabulations. Compared to other methods of interpolation, Generalized Pareto Interpolation has been shown to guarantee the smoothness of the estimated distribution, particularly for the top of the distribution (Blanchet et al., 2017).

[7] See also Cogneau et al. (2016) and Cogneau et al. (2018).

[8] The collection of data on household living conditions, on which the estimation of our inequality indicators is based, is not carried out every year in all countries due to its high cost. The database resulting from combining available surveys does not therefore cover all years for a given country. We thus interpolate income distributions between two years to cover every year from 1990 to 2019, by linearly interpolating the average income of each percentile.

[9] http://wid.world.

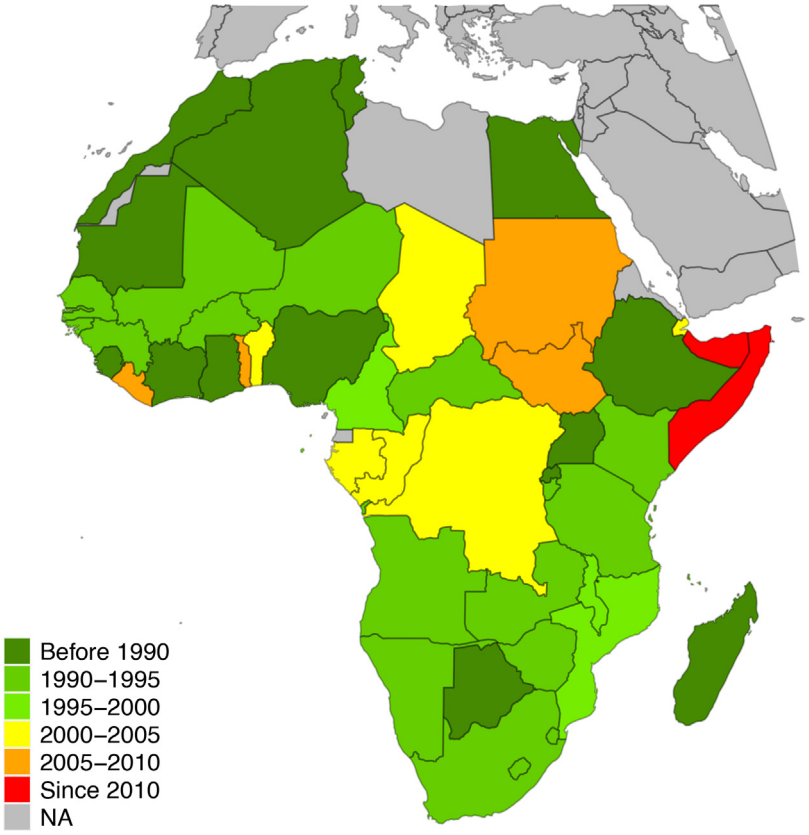


Fig. 2. Coverage of Survey Data Sources First Year of Available Household Survey Data by Country. *Notes*. Authors' computations using available survey data from PovcalNet.

it simply amounts to dividing the bracket average of each percentile of the pretax income distribution by its consumption counterpart. In order to make profiles comparable, we systematically normalize average pretax income or consumption to 1. Notice that since our aim is to use $c_1(p)$ as a multiplicative factor, the ratio of aggregate consumption to aggregate income is irrelevant: what matters is how $c_1(p)$ varies with p.

Fig. 3 plots income-consumption profiles in Côte d'Ivoire, Ghana, Guinea, Madagascar, Uganda, Thailand and India for various years. In nearly all surveys, the relationship between income inequality and consumption inequality is distinctively S-shaped. Average income is in general substantially lower than average consumption for the poorer half of the population. The ratio of income to consumption then increases more or less linearly up to percentiles 80 and 90, before rising exponentially at the top of the distribution. This is consistent with the intuitive mechanisms outlined above: poorer individuals tend to smooth their consumption, while the very rich tend to save a significant proportion of their current earnings. As a result, consumption inequality is generally lower than income inequality.

In order to characterize more precisely consumption-income profiles across surveys, we formulate $c_1(.)$ parametrically by using a scaled logit function of the form:

$$c_1(p) = \alpha + \beta \log(\frac{p}{1-p}) \quad (1)$$

For $p \in (0, 1)$. α is a constant which determines the starting point of the curve. It is irrelevant to our imputation problem, since multiplying the quantile function by α only affects the overall mean of the distribution. β is our parameter of interest: it determines how the ratio of income to consumption increases with p and is therefore a proxy of the extent to which income inequality is higher than income inequality.

Appendix Table A.1 reports the results of $\hat{\alpha}$ and $\hat{\beta}$ estimated by ordinary least squares, along with the corresponding adjusted R-squared. In nearly all cases, our scaled logistic function provides an excellent fit of income-consumption profiles, explaining over 90% of variations in the data. Our coefficient of interest $\hat{\beta}$ is always positive and varies little across surveys. Consumption series underestimate income inequality most in Thailand at the beginning of the 2000s ($\hat{\beta} = 0.16$), and least in Madagascar and Uganda at the beginning of the 1990s ($\hat{\beta} = 0.05$ in Madagascar and $\hat{\beta} = 0.06$ in Uganda). Beyond these two extremes, a majority of correction profiles range between 0.10 and 0.14.

Our objective is to provide a reasonable approximation of income inequality in Africa by transforming all available consumption distributions into pretax survey income distributions. To do so, we define three theoretical profiles reflecting the variability in $\hat{\beta}$ observed in the data, allowing us to derive "confidence intervals" for our income inequality estimates. For our benchmark scenario (scenario A henceforth), we use $\hat{\beta}_A = 0.12$; in scenario B, we correct distributions more moderately by imposing $\hat{\beta}_B = 0.10$; and we correct them more strongly in scenario C by using $\hat{\beta}_C = 0.14$. Fig. 4 plots our three correction profiles (setting $\alpha = 0.85$ to make them easily comparable with observed profiles).

3.3. From Survey Income to Fiscal Income

The second correction we apply to our survey distributions consists in correcting the average income of top earners. We refer to these top-corrected distributions as "fiscal income" in what follows. It is well-known that the rich are under-represented in sur-

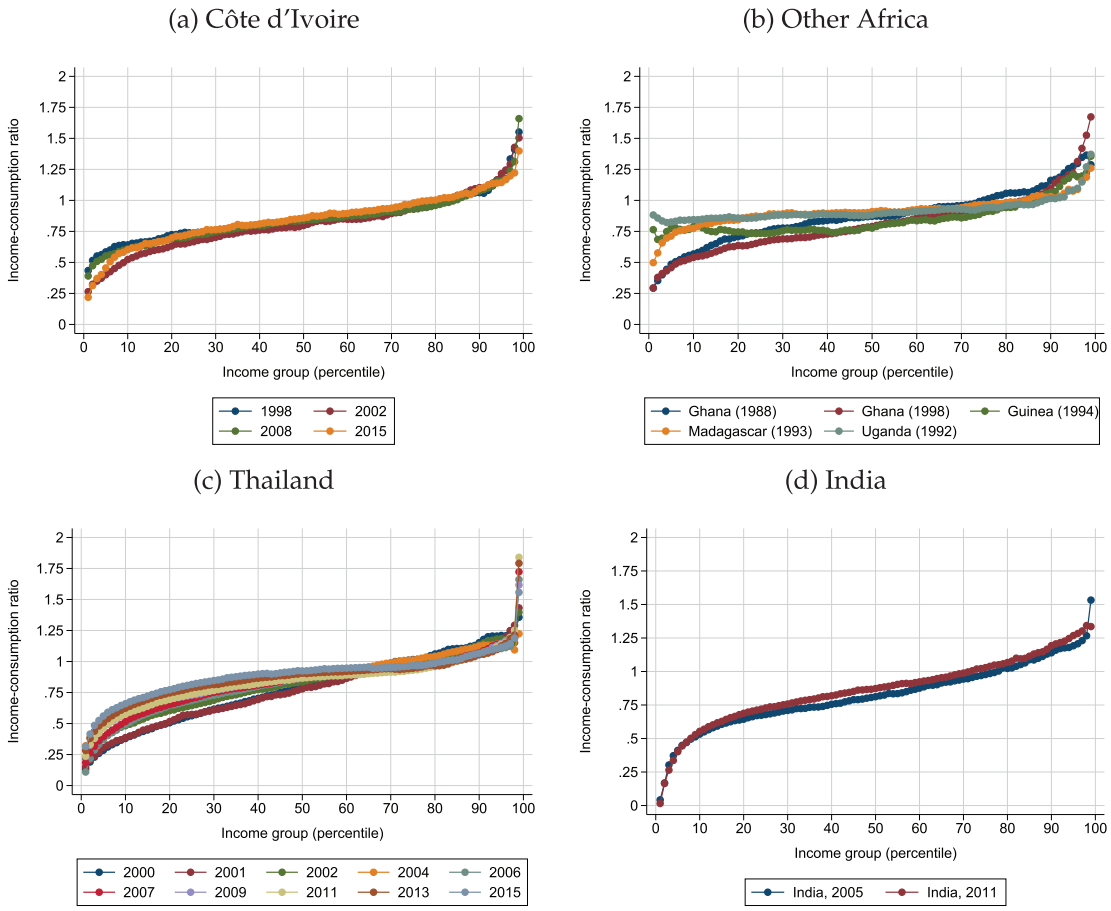


Fig. 3. Empirical Consumption-Income Profiles in Eight Countries. *Notes.* Authors' computations using survey data. The figure shows the ratio of average income to average consumption by percentile in each survey.

veys, because of both sampling and misreporting issues (e.g., Blanchet et al., 2022). In some cases, the representativeness of survey samples can be very questionable. In Côte d'Ivoire, for instance, surveys tend to underestimate specific groups when compared to population censuses. Among the poor, these include migrants from Burkina-Faso and Mali; among the rich, some surveys completely miss French expatriates and the Lebanese minority (Czajka, 2017). When some groups had a zero probability to be surveyed, no reweighting procedure will solve the problem (Ravallion, 2022). Many studies have attempted to correct for these biases by combining surveys with tax data, either in the form of tabulations or microdata. Tax data only cover a limited part of the population but provide better coverage of the very top of the distribution. While corrections based on tax data almost systematically yield higher inequality levels, little is known on the typical shape of these corrections and how this shape varies across countries.

Following the method used for consumption, our aim is to use existing data to define "plausible" profiles correcting income levels at the top of the distribution. In the African case, correcting for the under-representation of the rich in surveys is particularly challenging. To our knowledge, one of the only research papers combining surveys and tax data in an African country at the time of writing is Czajka (2017).[10] The paper exploits recently released tax tabulations from Côte d'Ivoire, and shows that the average pretax income of the top 1% could be underestimated by about 75% in the private sector. In other developing countries, the correction profiles of top pretax incomes obtained from matching surveys with tax data vary greatly across studies. In Brazil, Morgan (2017) finds that the average taxable income of the top 1% is 1.5 to 3 times higher than in surveys, with variations across years. Corresponding figures are found to be between 1.5 and 2.5 in Thailand (Jenmana, 2018) and as high as 3.5 in Lebanon (Assouad, 2017).

We look at variations in the underestimation of top incomes in Africa by bringing together surveys and tax tabulations from Côte d'Ivoire (Czajka, 2017) and South Africa (Alvaredo and Atkinson, 2010, **?**). For South Africa, we match the 2008, 2010 and 2012 surveys compiled in the Luxembourg Income Study (LIS) with the fiscal income series provided by Alvaredo and Atkinson (2010) and subsequent updates available from the World Inequality Database (Chatterjee et al., 2021). We then use the method developed by Blanchet et al. (2018) to combine surveys and tax data in order to get corrected pretax survey income distributions. The method essentially compares the distributions of survey pretax income and fiscal income, and finds a merging point where they cross. It then reweights survey observations so that the information on top incomes in the survey matches that observed in the tax data.

Exactly as in the case of consumption and income, our objective is to estimate "survey-fiscal" profiles $c_2(.)$ of the form:

$$c_2(p) = \frac{Q^F(p)}{Q^I(p)}$$

Where $Q^I(p)$ is the quantile function associated with the distribution of income observed in the survey, and $Q^F(p)$ is the quantile function of the distribution obtained after correcting for the

[10] See also Chatterjee et al. (2021) and Bassier and Woolard (2020) for preliminary evidence in the context of South Africa.

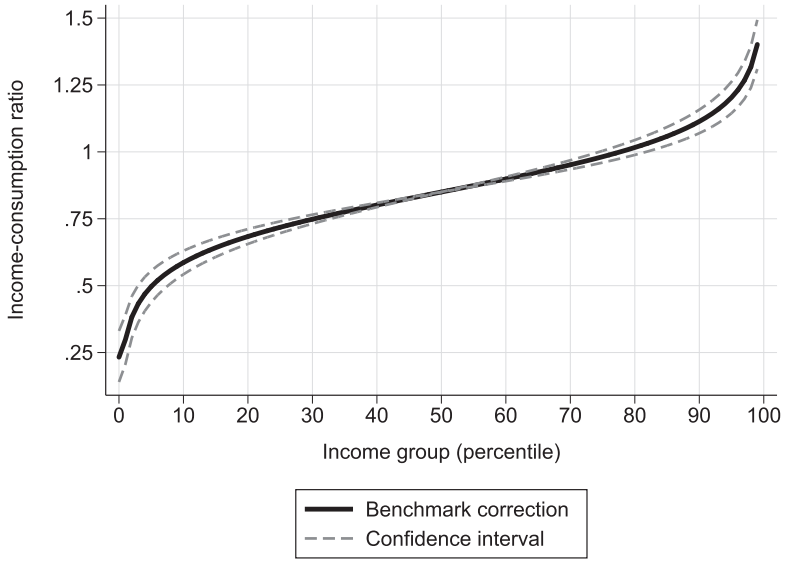


Fig. 4. Theoretical Income-Consumption Profiles. *Notes.* Authors' elaboration. The figure represents the three income-consumption profiles used to transform consumption distributions into income distributions. These profiles correspond to logistic functions of the form $Q_i(p) = \alpha + \beta_i \log\frac{p}{1-p}$ for $i \in A, B, C$. We set $\alpha = 0.85$ and $\beta_A = 0.12, \beta_B = 0.10, \beta_C = 0.14$.

under-representation of top incomes. The South African profiles can be computed by dividing the average incomes observed in the corrected distributions by their corresponding values in the surveys. In Côte d'Ivoire, the ratio of fiscal income to survey income by percentile is obtained from Chancel and Czajka (2017).

Fig. 5 plots survey-fiscal profiles in our two countries of interest. In Cote d'Ivoire, the ratio of corrected income to survey income is close to 1 before the 90^{th} percentile, and then increases exponentially. In South Africa, the correction starts much earlier (before the 80^{th} percentile), but rises more moderately. In both countries, surveys tend to largely underestimate top incomes, especially at the very top of the distribution. Correcting for this bias amounts to increasing the average of the top 1% by between 50% and 125%.

The correction profile of top incomes can be formally conceptualised as depending on two dimensions: the size of the group which is corrected, and the magnitude of the correction applied to top earners within this group. One way to formulate these two dimensions parametrically is to model survey-fiscal profiles by the quantile function of the Lomax (or Pareto Type II) distribution:

$$c_2(p) = \mu + \sigma(p^{1/\gamma} - 1)$$

For $p \in [0, 1]$. μ is a constant which determines the starting point of the curve; as in the case of consumption-income profiles, it is irrelevant to our problem. Since it makes sense to let $c_2(p)$ take the value 1 before a certain percentile p_0, one can set $\mu = 1 + \sigma$, so that $c_2(0) = 1$ and:

$$c_2(p) = 1 + \sigma p^{1/\gamma}$$

σ is the scale parameter. It controls the slope of the curve: the higher σ, the more top incomes are underestimated by surveys. γ is the shape parameter: as it decreases, the slope becomes more convex, so that a smaller fraction of top incomes is corrected.

While it is difficult to find regularities in the correction of top incomes given the paucity of comparable data across countries and across years, we believe that some correction is better than no correction at all, given what we know of countries with better data availability. In our benchmark scenario, we set $\sigma = 0.9$ and $\gamma = 0.05$. We then let σ vary from 0.6 to 1.2. As Fig. 6 shows, this approximately corresponds to rescaling incomes exponentially above the 80^{th} percentile (γ) and multiplying the average income of the top 1% by between 1.5 and 2 (σ). These bounds are in line with the different corrections observed in Côte d'Ivoire and South Africa. They are arguably sufficiently large to represent plausible variations in the correction of top incomes in Africa across countries and across time. If anything, this correction profile is likely to be a lower bound: in other developing countries such as Brazil, Lebanon or Thailand, it was not uncommon to find that the top 1% average was underestimated by a factor of 2 to 3 (Morgan, 2017; Assouad, 2017; Jenmana, 2018).

We illustrate the effect of the different adjustments presented in Sections 3.2 and 3.3 for the case of Morocco. Fig. 7 plots the top 10% share across years in Morocco adding up the corrections for conceptual discrepancies and underestimation of inequality at the top. Using the consumption distribution provided by PovcalNet, the highest decile received about 30% of total consumption, with no clear trend over the period. Moving from consumption to pretax income (Section 3.2) increases this value to 35–40%, while correcting top incomes (Section 3.3) further increases it to above 45% in our benchmark scenario. These results suggest that consumption-based measures from PovcalNet tend to underestimate the share of national income accruing to top 10% earners by as much as 40%.

3.4. From Fiscal Income to National Income

Under the assumption that our method for improving the measurement of income inequality is valid, the distribution we obtain corresponds to the distribution of pretax household income – that is, the sum of compensation of employees, mixed income and property income received by the household sector in the national accounts. To reach national income and obtain figures on individual incomes that are consistent with macroeconomic growth, we have to make assumptions on the distribution of unreported income components. These mainly include the taxes on production received by the general government and the retained earnings of corporations, which can represent a significant fraction of the national income in both developed and developing economies (Alvaredo et al., 2016).

In developed countries, and in some emerging economies, the levels of unreported income components can generally be

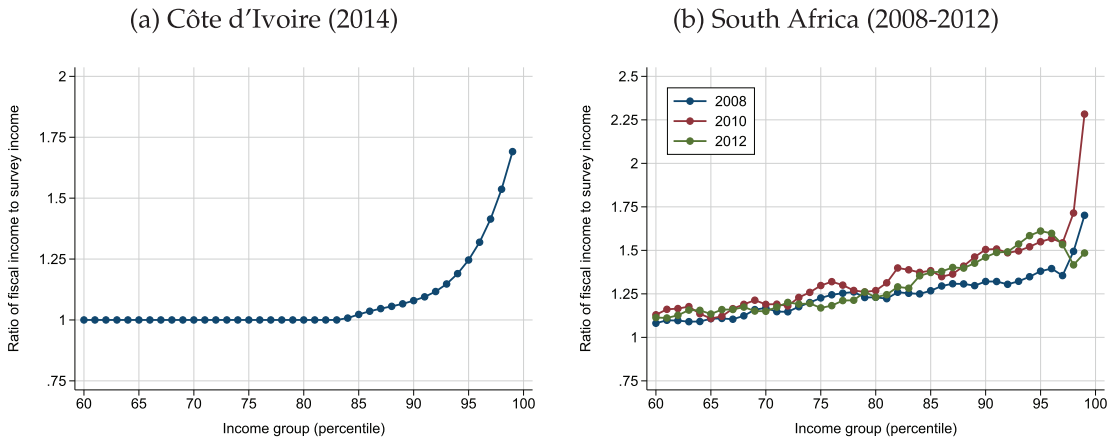


Fig. 5. Empirical Survey-Fiscal Profiles in Côte d'Ivoire and South Africa. *Notes*. Authors' computations combining survey and tax data. The figure represents the ratio of survey income to taxable income by percentile in each country.

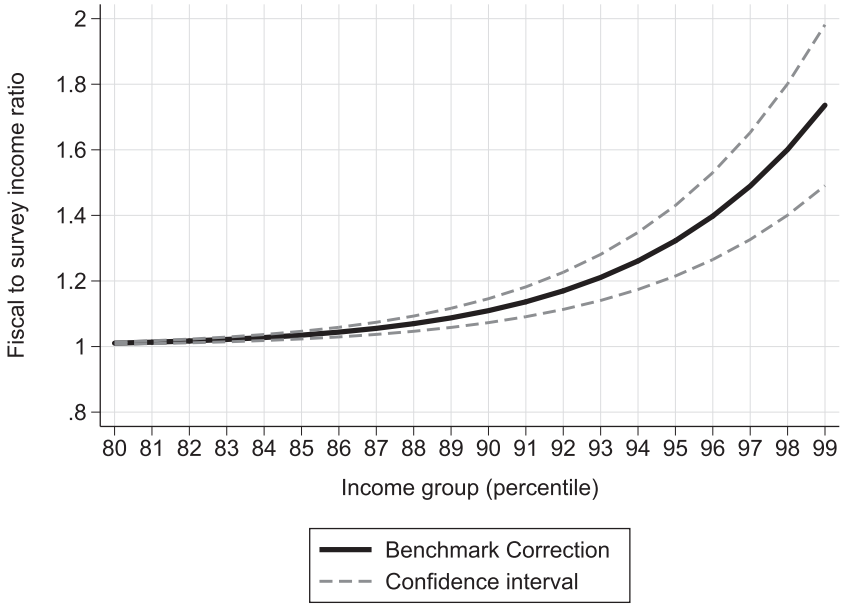


Fig. 6. Theoretical Survey-Fiscal Profile. *Notes*. Authors' elaboration. Profiles correspond to functions of the form $c_2(p) = 1 + \sigma p^{1/\gamma}$, with $\gamma = 0.05$ and σ taking 0.05, 0.6, and 1.2.

observed from national accounts, and various methods can be used to impute these components indirectly on the basis of household surveys. Unfortunately, this is not the case for most African countries, where national accounts are still in their infancy. As a result, we do not have access to reliable data on unreported income. We choose to distribute the gap between surveys and the net national income proportionally to individual income.[11] We stress that this step is far from optimal, given the relatively low quality of national accounts in some countries (see for instance Anand et al. (2015); Assouad et al. (2018) on this matter, and more specifically Jerven (2013) in the context of Africa). This choice is nevertheless motivated by the fact that national accounts remain the best comparable macroeconomic estimates available at the international level. This step therefore has the advantage of making average incomes and growth rates more comparable across countries and over time while keeping the overall distribution of pretax incomes unchanged.[12]

We also stress that this assumption is conservative: in most existing distributional national accounts studies, the imputation of unreported income leads to higher inequality levels, mainly because retained earnings are concentrated at the top the distribution (e.g., Blanchet et al., 2022; Piketty et al., 2018; Jenmana, 2018; Morgan, 2017; Chatterjee et al., 2021). As better national accounts data, survey microdata, and tax data become available, our estimates can be updated to account for such discrepancies.

[11] Net national income is equal to GDP, minus consumption of fixed capital, plus net foreign income. For more details, see the distributional national accounts guidelines (Alvaredo et al., 2020).

[12] Appendix Table A.4 presents the gap between survey means and net national income per capita in each country, revealing that this gap remains relatively large in most countries, with significant variations. That being said, the ranking of countries in terms of economic development remains relatively similar across measures. Our estimates of levels and trends in inequality in Africa as a whole are also barely affected by the use of survey means instead of national accounts aggregates (see appendix Fig. A.1).

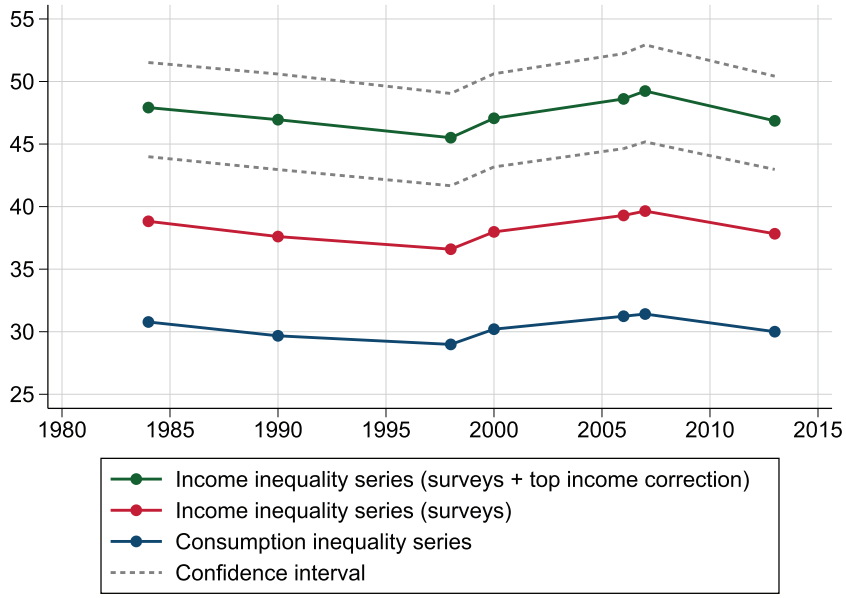


Fig. 7. Top 10% Income Share in Morocco, 1984–2014 From Consumption Inequality to Corrected Income Inequality. *Notes.* Authors' computations.

4. The Distribution of Income and Growth in Africa, 1990–2019

4.1. How Unequal is Africa?

4.1.1. Inequality in African Countries

Is Africa a low or high inequality continent? Although our estimates should be interpreted with care, they suggest income inequality is very high in most African countries, especially in international perspective. The income earned by the top 10% of the distribution ranges from 37% in Algeria to 67% in Botswana (Fig. 8), while the bottom 40% is at most 14% in Algeria, and is about 4% in South Africa (Fig. 9).

[Figs. 8 and 9 about here].

Significant regional differences appear across the African continent. Southern Africa is by far the most unequal region, with the top 10% share exceeding 65% in South Africa and Botswana. Inequality is slightly lower in Central Africa, but remains very high by international standards: for instance, in Congo in 2011, 56% of national income accrued to the 10% income earners, while the bottom 40% income share was 7%. Eastern African countries appear less unequal, especially at the bottom of the income distribution: in Kenya in 2015, for instance, the top 10% received 48% of national income and the bottom 40% about 9%.

Income inequality tends to decrease as one moves towards the North and the West of the continent. In Sierra Leone in 2011, the top 10% owned 42% of national income, and the bottom 40% owned 12%; its neighbors display comparable income shares. The lowest inequality levels can be found in Northern Africa; Algeria appears as the least unequal country in Africa, as in 2011 37% of national income was captured by the top 10% of the distribution, while the bottom 40% received 14%.[13]

4.1.2. Inequality in Africa as a Whole

Africa stands out as one of the continents with the highest levels of regional income inequality. According to our estimates, the top 10% of Africans captured 54% of national incomes in 2019, while the bottom 50% received only 9% (Fig. 10). From an international perspective, the top 10% income share is 34% in Europe (550 m individuals), 41% in China (1.4bn individuals), 47% in the United States (330 m individuals), 55% in Brazil and the rest of Latin America (210 m individuals), 56% in India (1.3bn individuals), and 61% in the Middle East (420 m individuals). A particularly striking characteristic of the pan-African distribution is the extent of the gap between the top 10% and the bottom 50% income shares. Average incomes of the top 10% are about 30 times higher than those of the bottom 50%, well above the value found in other extreme inequality regions (the ratio is around 20 in the Middle East, India, or Brazil: see Fig. 1). This finding reveals the dual and polarized nature of the pan-African income distribution, with extremely low incomes at the bottom and relatively high incomes

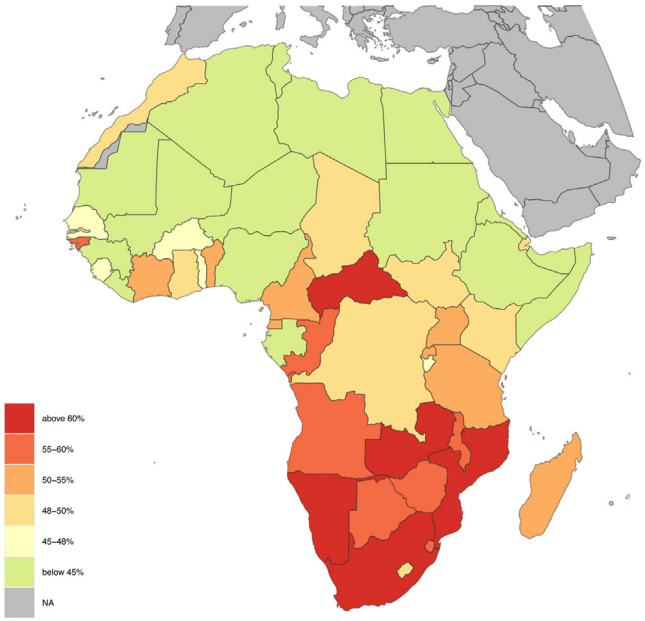


Fig. 8. Top 10% Income Shares in Africa in 2019. *Notes.* Authors' computations combining survey, tax, and national accounts data using the different methods presented. Interpolation between survey years and straightforward extrapolation are implemented to estimate current levels of inequality.

[13] Regarding Algeria, whose inequality level appears very low by regional standards, the lack of transparency and the absence of recent data (the last available survey dates back to 2011) make it difficult to properly evaluate the reliability of inequality estimates. Going further back in time, inequality seems to have decreased since the 1990s. However, at this stage, we lack elements to assess this evolution.

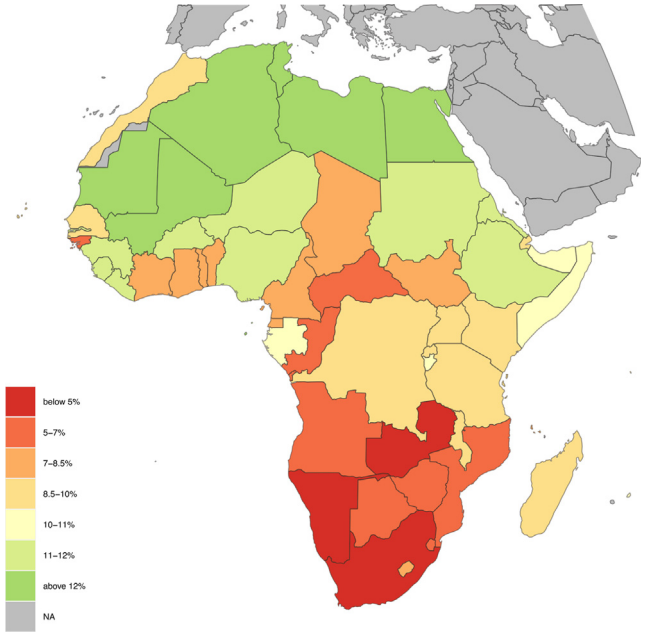


Fig. 9. Bottom 40% Income Shares in Africa in 2019. *Notes*. Authors' computations combining survey, tax, and national accounts data using the different methods presented. Interpolation between survey years and straightforward extrapolation are implemented to estimate current levels of inequality.

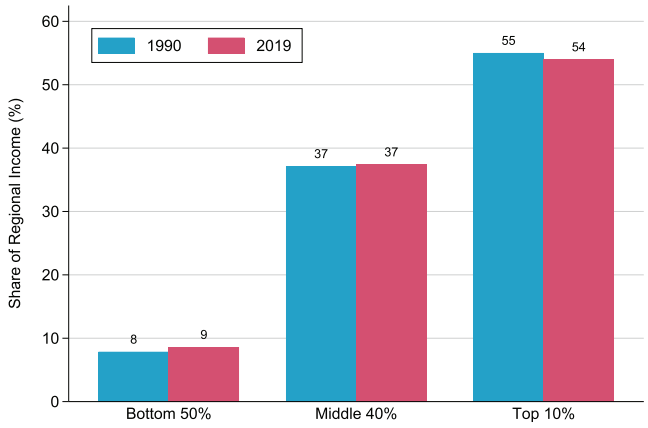


Fig. 10. Evolution of the Pan-African Income Distribution. *Notes*. Authors' computations combining survey, tax, and national accounts data using the different methods presented. Interpolation between survey years and straightforward extrapolation are implemented to estimate current levels of inequality.

at the top. As shown in Fig. 10, overall income inequality in Africa seems to have remained very stable since the 1990s. The top 10% income share decreased from 55% to 54%, while the bottom 50% share increased from 8% to 9%.

Is inequality on the African continent mostly due to inequality within African countries or to cross-country differences in average national incomes? Fig. 11 decomposes overall African inequality into its between-country and within-country components by plotting two counterfactual scenarios: one in which countries would have the same average national income, and one in which individuals within each country would have the same income. Inequality within countries stands out as explaining the bulk of pan-African income inequality. If there was no inequality between countries, keeping current within-country inequality levels constant, the top 10% income share in Africa would be 48%, only slightly lower than its actual value (54%). Conversely, if all individuals had the same income within each country, keeping national average income differences constant, the top 10% income share would drop to only 24%. A Theil decomposition of African inequality levels shows that 25% of African inequality can be attributed to the between-country component and as much as 75% to the within-country component.

The slight decline in overall African inequality since the 1990s has been mostly due to the dynamics of between-country inequality. This reduction was caused by several phenomena. Since the 1990s, several countries located at the middle of the African distribution in terms of national income per capita, such as Nigeria, Morocco, Ghana, Angola, Tunisia, or Namibia have seen their average income increase significantly. On the other hand, the average income of Africa's richest countries (Algeria, South Africa, or Libya for example) stagnated in the 1990s, and increased only moderately in the 2000s. Meanwhile, the poorest countries did not experience any significant increase in average income. This explains why the top 10% between-country income share decreased more than the bottom 50% increased.

The dynamics of between- and within-country inequality in Africa contrast with those observed at the global level, in Europe, or in Asia. At the global level, we observe a significant reduction of between-country inequality, which has been partially or entirely offset by a rise in within-country inequality (see Chancel et al., 2022).[14] In Europe, contrary to Africa, most of the evolution in pan-European income inequality stems from within-country dynamics. Turning to Asia, the huge rise of inequality recorded in China and India (which amount to about 60% of the regional population) over the past four decades meant that a significant share of the rise of pan-Asian income inequality is explained by within-country changes. That being said, the African exception could also reflect the quantity of noise that plagues survey measurements and blur the evolution of within-country inequality.

4.2. Accounting for Differences in Inequality Patterns across Africa

Why are inequality levels in Africa so high? This question is particularly challenging to address because of strong data limitations, as well as of the specificity and diversity of Africa's economic and political structures, shaped by both colonial heritage and its recent history. In the following two subsections, our objective is not to provide a definitive explanation for the diversity of inequality levels found in Africa, but merely explore the role of historical factors on the one hand, and of government redistribution policies on the other.

4.2.1. Historical Determinants: Settler Colonialism, Socialism and Islam

Contemporary African inequality levels could reflect both the situation at the moment of countries' independence, and the political economy and institutions that followed (Cornia, 2019; Heldring and Robinson, 2018). In this section, we examine to what extent regional patterns of income inequality may be explained by long-term history. The evidence we present is only suggestive, and its interpretation can only be speculative.

First, our analysis suggests that high levels of inequality are typically found in countries that experienced European settler colonization, a type of colonization that resulted in high land and capital concentrations and in many cases restricted the access of natives to education and good jobs (Alvaredo et al., 2021). The long-run impact of settler colonialism might account for the high inequality levels in Southern Africa. Second, we uncover a large and robust negative correlation between income inequality and the spread of Islam. This negative correlation, whose interpretation will require further research,

[14] On the evolution of global income inequality in recent decades, see also Anand and Segal (2017), Lakner et al. (2016).

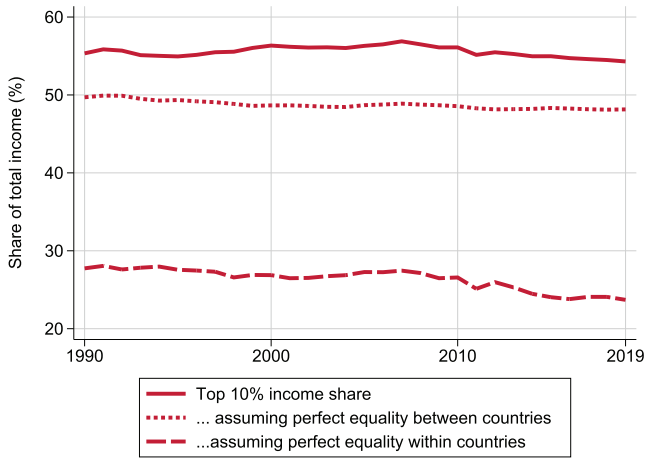


Fig. 11. Decomposing Pan-African Inequality: Top 10% Income Share (1990–2019). *Notes.* Authors' computations combining survey, tax, and national accounts data using the different methods presented. Interpolation between survey years and straightforward extrapolation are implemented to estimate current levels of inequality.

might account for the lower levels of inequality observed in the Western and North-Eastern regions of Sub-Saharan Africa, as well as in North Africa to some extent. Last, we show that other long-term factors, such as geography, precolonial history, and colonizers' identity do not correlate with country-level income inequality.

Among the countries with the highest income share of the richest 10%, South Africa and Namibia are still today inhabited by a significant number of people of European descent. The direct descendants of British, Dutch, French, and German settlers now make up 8% of the population in South Africa, and around 6% in Namibia. In 2019, the top 10% income share was estimated at 66% in South Africa and 64% in Namibia. As is well-known, apartheid in South Africa was only terminated in 1994 (and in 1990 in Namibia). In 1987, white South Africans represented 90.5% of top 5% income earners, while Coloured, Asians, and Blacks represented 4, 3, and 2.5%, respectively (Alvaredo and Atkinson, 2022). In the same region, European descendants still represent around 2% of population in Eswatini, and 1.2% in Botswana (Putterman and Weil, 2010) and these two countries also display rather high top 10% shares (respectively, 59.5 and 58.9%).[15] At the world level, Putterman and Weil (2010) show that in countries where people of European descent are mixed with natives and with people of other origins, income inequality is higher, while descendants of Europeans tend to lie at the upper end of the income distribution. Apart from South Africa and Namibia, the most salient cases are found in Latin America and the Caribbean.

Yet, Easterly and Levine (2016) have also argued that the consequences of settler colonialism extend after the departure of Europeans. Settler colonialism had a long-term impact on institutions, human and physical capital accumulation, and finally on GDP per capita. It could also have left a persistent imprint on inequality. Outside of South Africa and Namibia, although significant numbers of European expatriates can be found in some countries, Africa-natives of European descent are now very small minorities. Nonetheless, many other countries received significant numbers of European settlers in the past. We make use of the data set built by Easterly and Levine (2016) to identify countries that experienced settlement colonialism between 1870 and 1970. Over this period of a hundred years, we categorized countries as former settlement colonies if the share of Europeans in the total population went above 2.5% at some point in time.[16] This threshold of 2.5% is not too arbitrary. Only a few countries exhibit shares between 1% and 2.5%: Egypt (1.4%), Gabon (1.3%), Senegal (1.2%), where Europeans were mostly administrators and traders, and the islands of Cabo Verde (2%) and São Tomé and Principe (1.9%), which were uninhabited before Europeans arrived; for 30 countries, the maximal European share is just below 0.25%. With the 2.5% threshold, we are left with 12 settler countries out of 54. Over 1870–1970, the maximum share of Europeans reached 21% in South Africa and 14% in Namibia.[17] In the Northern neighborhood of South Africa, the two former Rhodesias, now Zimbabwe and Zambia, belong to our group of settler colonies. Their poor neighbor Malawi (former Nyasaland), with which they formed a Federation between 1953 and 1963, also received Scottish settlers, yet the figure of 2.7% from Easterly and Levine (2016) for 1956, taken from Curtin et al. (1995), is overestimated. Further North, the highlands of Kenya received British settlers who captured a significant fraction of arable land, yet their share in population never went above 1% (Bigsten, 1986).[18] In Zimbabwe, white power remained until 1979 and settlers started to migrate out right after, then at an accelerated pace in the 21st century. White Zimbabweans now constitute a very tiny group, estimated at less than 0.2% of population, much like white Zambians. Portuguese Angola and Mozambique were also settlement colonies, until the independence wars that ended in 1975, after which most of the settlers quickly left. At the other end of the continent, the three French colonies of North Africa were also exposed to large European settlement, first Algeria, then Tunisia, and Morocco (Cogneau et al., 2021). In Algeria and Tunisia in the late colonial era (1950s), top income inequality was as high as in South Africa, as income tax tabulations reveal (Alvaredo et al., 2021).[19] Again, most settlers had left at the end of the 1960s, not long after the countries' independence. The neighboring Italian colony of Libya also received a large number of settlers. Italians left in two waves, first in the late 1940s after independence, and then in the 1970s after Muammar Gaddafi took power. According to our criterion, we also categorize the island of Mauritius as former settler colony, where French and British settlers owned plantations, even after the abolition of slavery.

A first direct consequence of settler colonialism is the unequal distribution of land for agriculture (Frankema, 2010). We gathered data on Gini coefficients of the land size distribution from various sources. Only 33 countries have non-missing data for some year after independence.[20] In this subsample, the nine former settler colonies come out with an average land Gini of 0.65 that is higher by almost 0.15 (p-value = 0.007) than the average of non-settler countries (0.49). If we exclude South Africa, i.e., one of the two countries where descendants of European settlers still weight more than 2.5% of population, the difference is maintained at 0.13 (p = 0.016).[21] Settler colonies of North

[15] In the colonial era, Eswatini (former Swaziland) and Botswana (former Bechuanaland) were largely administered by white South Africans, like Namibia (former South West Africa) between 1920 and 1990; on Botswana, see Bolt and Hillbom (2016).

[16] We complemented the Easterly and Levine (2016) data set for Libya and Mozambique. We also corrected their data for Djibouti, Kenya, and Malawi, which contained obvious overestimates. Easterly and Levine (2016) used the share of Europeans in the population fifty years before independence. Yet, their data are patchy, and for many countries the share they retain actually corresponds to a later date (1956 for Tunisia and Morocco, versus 1860–1911 for Algeria). We think their criterion fits better for the early colonialism in Latin America and the Caribbean (that lasted a longer time) than for the late colonialism of the 19th century, in Africa or Asia. In many countries again, such as Morocco and Zambia, significant inflows of settlers came in during the Interwar period, or even after 1945. We capture a kind of settlement colonialism that was more short-lived than the one they measure.

[17] According to our criterion, Eswatini is a former settler colony, but Botswana is not. The patchy nature of the data prevents us from exploiting a continuous measure of the *intensity* of settlement.

[18] If we disregard the demographic threshold of 2.5%, and classify Kenya and Malawi as settler colonies, our results are very little changed.

[19] The top 1% share was even higher in Zambia and Zimbabwe.

[20] 2 in the 1960s, 8 in the 1970s, 5 in the 1980s, 12 in the 1990s, and 6 in the 2000s. We combine data assembled by the NGO Grain, in particular from FAO reports, Frankema (2010), Vollrath and Dietrich (2007) from agricultural censuses.

[21] Namibia is missing, yet a recent World Bank Report notes that "70% of Namibia's 39.7 million hectares of commercial farmland is still owned by Namibians of European descent" (World Bank, 2022; World Bank, 2022, pp. 4 and 60–66).

Africa (Algeria, Libya, Morocco, Tunisia) make no exception in this regard, with an average Gini of 0.68 (all data are from 1987 to 2001). In contrast with many Asian countries, land reforms in Africa have been limited, even in socialist Algeria and Tunisia (Bessaoud, 2007).

Land inequality is not the only channel through which the legacy of settler colonialism can impact present income inequality. Inequality in other assets (capital, education), the dualistic or segmented structure of the labor market, as well as economic or political institutions are other potential channels. When contrasting the 12 former settler colonies with other countries, we find a significant difference in the top 10% share, of 5.5 percentage points (p-value = 0.017); the bottom 50% share is lower by 2.1 p.p. (p = 0.054). However, as pointed out before, North Africa is the least unequal region, which drags this correlation down. When restricting the analysis to Sub-Saharan Africa (49 countries out of 54), the differences between former settler colonies and other countries doubles, reaching 11 p.p. for the top 10% ($p<0.001$), and −4.9 p.p. for the bottom 50% ($p<0.001$). In North Africa, independent Algeria, Tunisia, Libya, and Egypt all embraced, at least for some time, some form of socialism that maintained a state-controlled economy and relatively high levels of public spending. Instead, the Kingdom of Morocco remained under a monarchical and conservative government, which could partly explain its relatively higher level of inequality today. The presence of strong states that adopted a socialist orientation at some point might be one explanation for North Africa's exceptionalism.

When looking at the maps of Figs. 8 and 9, another historical correlate of inequality is revealed, that is the extension of Islam. Most of the countries in which the majority of population is Muslim appear in green or light yellow colors: in North Africa; on the Western coast from Mauritania to Guinea; and in the Sahel strip, from Mali to Sudan. The only exceptions are Morocco (99% Muslim) and Chad (56%), yet their estimated top 10% share is just above the 48% upper threshold of light yellow color, at 49%. Indeed, the negative correlation of the top 10% share with an estimate of the proportion of Muslim population in 2010 (Kettani, 2010) stands at −0.57 ($p<0.001$); the positive correlation with the bottom 50% is 0.62 ($p<0.001$). When setting apart North Africa, where the share of Muslims is above 94% in all five countries, the correlations are only slightly lower (respectively −0.50 and + 0.53, $p<0.001$).

The interpretation of these correlations is more difficult than for settler colonialism. Note first that Islam may have interacted with colonialism. European colonizers and missions tended to favor non-Muslim areas (e.g., Cogneau and Moradi, 2014; Cogneau and Moradi, 2014). In contrast, Islamized areas experienced lower investments by missionaries in education and health, and lower penetration by the colonial state in terms of administration and social services (Bauer et al., 2022).[22] Muslim elites were less often involved in colonial rule than evangelized elites, and, if in power after independence, they could have more strongly broken with the unequal legacy of colonialism. Moreover, Islamic thought shows a tradition of egalitarianism that may influence state policies as well as individual behavior (Marlow, 1997). Yet, one can first note that, outside of Africa, in majority Muslim Middle East, income inequality is large (Alvaredo et al., 2019). Second, if Islamic charity translates into large private transfers to the poor, then the income-consumption profile might be steeper than what we have assumed, so that income inequality would be underestimated; or else, egalitarianism and the culture of charity may lead rich individuals to under-report their income more often, out of shame. Nonetheless, the income-consumption profile of majority Muslim Guinea is even flatter than neighboring Côte d'Ivoire (see Fig. 3). Third, in Sub-Saharan Muslim Africa, households are larger, so that part of intra-household inequality is missed by standard surveys, leading to a significant underestimation of total inequality (De Vreyer and Lambert, 2021). While it is too early to conclude, the negative correlation between Islam and (measured) income inequality certainly deserves further research.

Finally, we ask whether settler colonialism and the spread of Islam are robust correlates of income inequality, when compared with other potential historical correlates. As mentioned above, we measure settler colonialism with a binary variable that is equal to one if the European population represented more than 2.5% of the total population, at some point in time between 1870 and 1970. This is true for 12 African countries out of 54; four are in North Africa, and seven belong to a large Southern cone (Angola, Eswatini, Mozambique, Namibia, South Africa, Zambia, and Zimbabwe), the island of Mauritius being the last one. We measure the spread of Islam with the share of Muslims in the total population circa 2010. 18 African countries have a majority Muslim population (more than 50%).

We first restrict the analysis to Sub-Saharan Africa, and show simple OLS regressions of the top 10% and bottom 50% income shares on these two variables (see Tables 1 and 2). Both coefficients are very significant, both economically and statistically speaking. Having been exposed to settler colonialism is associated with a 8.9 percentage points higher top 10% share, and with a 3.8 p.p. lower bottom 50% share. Going from 0 to 100% of Muslims lowers the top 10% share by 6.6 p.p., and adds 3.4 p.p. to the bottom 50% (Table 1, column A). The two variables alone explain more than 40% of the variance of income shares across countries (adjusted R-squared). They are quite correlated with the regional patterns that are visible in Figs. 8 and 9, as settler colonialism mainly affected countries in Southern Africa, and Islam is more widespread in Western Africa. If we break down Sub-Saharan Africa into four regions (North-Eastern, Western, Eastern and Southern), regional differences also explain 35 to 42% of the variance in income shares (Table 1, column B). Small islands, which are specific in that they were uninhabited before slavery and colonization, display significantly lower levels of inequality. Yet, a horse race between our two historical variables and regional dummies shows that the former are not subsumed under the latter. Both historical variables remain very significant, both coefficients are just slightly reduced by around 15% (Table 1, column C). Furthermore, they are almost able to explain all the contrast between the most equal (North-Eastern and Western) and the least equal regions (Southern). If we except the small islands' specificity, regional dummies turn statistically insignificant as a whole.

In Table 2, we then confront our two historical variables with other potential long-term correlates of present-day income inequality. We consider three groups of alternative factors (see Table 1 footnotes for a precise description of the variables). The first one is geography. Although rainfall, temperature and distance to the sea should not directly impact income inequality, they could for example condition agricultural productivity and the potential earnings of farmers. A second group relates to precolonial history (inside present-day borders, which were delineated by colonizers): the slave trade, precolonial polities, and ethnic fractionalization. The three dimensions are potentially intertwined, as the slave trade may have affected the political structures that were observed by anthropologists at the end of the 19th century or at the beginning of the 20th, and ethnic fractionalization as well; ethnicities can also be characterized by diverse political cultures. By enriching local traders, the slave trade might have had a long-term unequalizing impact; conversely, by increasing labor scarcity, after abolition it might have led to higher earnings for unskilled free labor, hence

[22] Indeed, Sub-Saharan Muslim countries feature lower levels of education today. Yet, we found no correlation between income shares and mean years of schooling in 2015. Therefore, despite its positive correlation with settler colonialism and its negative correlation with the share of Muslims, average education does not explain the correlations of the two historical variables with inequality. Data for mean years of schooling in 2015 are from the Human Development Report 2021/2022 (UNDP, 2022).

Table 1
European settlement and Islam correlates versus regional differences. Sub-Saharan Africa

	Top 10% income share			Bottom 50% income share		
	A	B	C	A	B	C
European settlement	+0.089***		+0.075***	−0.038***		−0.028**
	(0.021)		(0.023)	(0.010)		(0.010)
Muslims share	−0.066***		−0.058**	+0.034***		+0.029**
	(0.022)		(0.026)	(0.010)		(0.012)
North-Eastern		−0.066**	−0.025		+0.033***	+0.014
		(0.026)	(0.026)		(0.012)	(0.012)
Western		−0.056***	−0.020		+0.025***	+0.009
		(0.019)	(0.020)		(0.008)	(0.009)
Southern		+0.065**	+0.018		−0.035***	−0.017
		(0.026)	(0.026)		(0.012)	(0.012)
Small islands		−0.048	−0.071**		+0.024*	+0.034***
		(0.029)	(0.027)		(0.013)	(0.012)
F-test regional variables (p-value)		0.000	0.592		0.000	0.277
N	49	49	49	49	49	49
Adj. R^2	0.439	0.348	0.508	0.436	0.415	0.543

Source: authors' computations.
Standard errors in parentheses; *: $p < 0.1$; **: $p < 0.05$; ***: $p < 0.01$.
European settlement: Dummy for whether European settlers went above 2.5% of total population between 1870 and 1970 (Easterly and Levine, 2016).
Eur. settlement: Angola, Eswatini, Mozambique, Mauritius, Namibia, South Africa, Zambia, Zimbabwe.
Muslim share: proportion of Muslims in total population circa 2010.
Muslims > 50%: Burkina Faso, Chad, Comoros, Djibouti, Guinea, Guinea Bissau, Mali, Mauritania, Niger, Sudan, Senegal, Sierra Leone, Somalia.
North-Eastern: Djibouti, Eritrea, Ethiopia, Somalia, Sudan, South Sudan.
Western: Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo.
Eastern (omitted): Burundi, Comoros, Kenya, Madagascar, Mauritius, Mozambique, Malawi, Rwanda, Seychelles, Tanzania, Uganda, Zambia.
Southern: Botswana, Eswatini, Lesotho, Namibia, South Africa, Zimbabwe.
Small islands: Islands that were uninhabited before slave trade and colonization: C. Verde, Mauritius, São Tome & P., Seychelles.
F-test for regional variables does not include the small islands dummy.

Table 2
European settlement and Islam correlates versus geography, precolonial history, and colonizers' identity. Sub-Saharan Africa

	Top 10% income share					Bottom 50% income share				
	A	B	C	D	E	A	B	C	D	E
European settlement	+0.089***	+0.073***	+0.089***	+0.074***	+0.058**	−0.038***	−0.029**	−0.038***	−0.032**	−0.024**
	(0.020)	(0.028)	(0.021)	(0.021)	(0.029)	(0.009)	(0.010)	(0.012)	(0.009)	(0.013)
Muslims share	−0.079***	−0.092***	−0.080***	−0.090***	−0.101***	+0.041***	+0.050***	+0.039***	+0.050***	+0.057***
	(0.020)	(0.024)	(0.027)	(0.022)	(0.032)	(0.009)	(0.010)	(0.012)	(0.009)	(0.013)
Controls:		p-value	p-value	p-value	p-value	p-value	p-value	p-value	p-value	p-value
Geography		0.587			0.775		0.173			0.475
Slave exports			0.199		0.194			0.155		0.106
Precolonial pol.			0.809		0.684			0.874		0.588
Ethnic fract.			0.863		0.743			0.972		0.976
Colonizer ident.				0.211	0.274				0.058	0.078
N	49	49	49	49	49	49	49	49	49	49
Adj. R^2	0.520	0.506	0.495	0.545	0.506	0.533	0.568	0.520	0.594	0.624

Source: authors' computations.
Standard errors in parentheses; *: $p < 0.1$; **: $p < 0.05$; ***: $p < 0.01$.
European settlement and Muslims share: see Table 1 and text.
Geography: Abs. latitude, longitude, min month. avg rainfall, max month. afternoon avg humidity, min avg month. low temp, log(coastline/area). (Nunn, 2008).
Slave exports: Log total slave exports normalized by historic population (Nunn, 2008); results are similar with slave exports normalized by land area.
Precolonial polities: Percentages of population from Centralized Stratified, Centr. Egalitarian, and Fragmented Strat.groups; Frag. and Egal. being omitted (Gennaioli and Rainer, 2007). The variables were constructed using the dataset from Michalopoulos and Papaioannou (2013), as some countries were missing in Gennaioli and Rainer (2007).
Ethnic fractionalization: Alesina et al. (2003). Sao Tome and Principe was set at the value for Cabo Verde.
Colonizer identity: Dummy variables for the last colonizer being either Belgian, British, French, or Portuguese (Somalia has 0.5 for British as it was shared with Italy), and for non-colonized (Ethiopia and Liberia).
In all regressions, a "small island" dummy is included: Cabo Verde, Mauritius, São Tome & P., Seychelles. These islands were uninhabited before slavery and colonization. For them, the precolonial dummies were set at zero (meaning 100% was fragmented and egalitarian); given the small island dummy, this has no impact on reported point estimates.

reducing inequality. Although the effect of centralized precolonial structures is perhaps ambiguous, hierarchical political structures, which we also distinguish, may be hypothesized to be more unequal. Ethnic fractionalization may generate vertical inequalities in some places, whereby politically dominant groups would be economically advantaged. Finally, a third set of historical factors is the national identity of the colonizer (Belgian, British, French, etc.). Colonizers' effects may go through different educational policies and local elite formation (Ricart-Hughuet, 2021). Past works have argued that these three groups of long-term factors could explain differences in GDP per capita, or the quality of institutions (e.g., Sachs and Warner, 1997,Sachs and Warner, 1997; Nunn, 2008, Nunn, 2008; Gennaioli and Rainer, 2007,Gennaioli and Rainer, 2007; Easterly and Levine, 1997,Easterly and Levine, 1997; Porta et al., 2008,Porta et al., 2008). Here, we ask whether they correlate with income inequality. It seems that they do not. None of the three groups of variables comes out with statistically significant coefficients, and none is able to explain a significant share of the variance

among African countries. In this respect, settlement colonialism and the spread of Islam do a much better job than geography, pre-colonial history, or the identity of the colonizer.

In Appendix Tables A.5 and A.6, we run the same regressions on the whole sample of African countries, hence adding the five countries of North Africa. Both the European settlement variable and the Muslims share preserve their high significance, even if, as expected, the coefficient of the former is reduced. In this case, the two variables do not suffice to erase regional differences, in particular between Northern and Southern Africa. In the countries of North Africa that received a lot of French and Italian settlers (Algeria, Libya, Morocco, and Tunisia), the equalizing effect of Islam is not high enough to explain why inequality is low. To get there, we would need to allow Islam to be more inequality-reducing in former settler colonies. It is not impossible that the type of Arab socialism that was experimented in North Africa (with the exception of Morocco), as it combined with Islam as a state religion, was quite effective in mitigating inequalities and in cancelling out part of the unequal legacy of settler colonialism. More research is warranted in order to go beyond the mere speculation developed in this section.

4.2.2. Redistribution Policies and Inequality in Africa

Most African countries have still significant progress to make regarding government redistribution, from increasing the fiscal space to improving tax progressivity, implementing efficient social protection systems, and providing high-quality quality public services. These issues are all the more pressing as existing research suggests that improvements along these margins are key drivers of inequality reduction in Africa.

In terms of government revenue, Africa is lagging behind all developed and many developing world regions (Fig. 12). A large group of countries in Middle, Western and Eastern Africa is characterized by low government revenue, below 20% of GDP. Only richer Northern and Southern African countries succeed in collecting more than 30% of GDP in taxes. For most African governements, low state capacity hinders their ability to reduce income inequality. In some countries, fiscal capacity has improved during the two last decades, in particular on the side of domestic taxation; yet in many countries, government revenue remains highly dependent on mineral resources and their volatile international prices (Cogneau et al., 2021).

The impact of progressive taxation on posttax income inequality is straightforward, but its role in shaping pretax income inequality is also real, through capital accumulation and wage bargaining (Piketty et al., 2014). In Africa, redistribution through taxation is limited. Personal top income tax rates are lower than in the developed world in most African countries (Fig. 13b). For a quarter of the countries for which data is available, top personal income tax rates amount to 25% or less. For half of countries studied, top personal income tax rates lie between 30 and 40%. Only eight countries have top marginal tax rates higher than or equal to 40%, comparable to those observed in rich countries. According to Odusola (2017), more generally, African tax systems tend to be regressive.

Social protection and assistance coverage are still minimal. African Development Bank (2011) provide a comprehensive review of social protection in Africa, demonstrating that it can have a significant impact on poverty and inequality. Nonetheless, only a fifth of countries where data is available, mostly located in the South and the North, provide social insurance, social safety nets, or unemployment benefits to more than 45% of their population (Fig. 13c). This figure was 54% in Brazil in 2015, and 63% in China in 2013.

Public services can also strongly impact income inequality through their influence on education and health inequalities. This issue is particularly relevant in Africa, where despite a substantial rise in primary enrollment rates in the last decades, the quality of public education remains low (Bhorat and Naidoo, 2017; Bold et al., 2017). In most African countries, total government expenditure on education falls below 5% of GDP. This is particularly true in Central and Eastern Africa, but also in comparatively rich countries such as Egypt and Algeria (Fig. 13d).

Given the relative scarcity of data, estimating the incidence of taxes and transfers on inequality in each African country would require methods and data collection efforts that go far beyond those exploited in this paper. That being said, recent fiscal incidence studies (e.g., Lustig, 2018) and historical data collection efforts (e.g., Bachas et al., 2022) have shed new light on the potential impact of taxes and transfers on inequality in developing countries. Drawing on these various data sources, Gethin (2022) constructs a new database covering estimates of the distribution of taxes and transfers worldwide since 1980. Although results should be interpreted with care given their preliminary nature and previously mentioned data limitations, appendix Fig. A.2 suggests that taxes and transfers only have a minimal impact on the level and evolution of inequality in Africa. Moving from pretax income to posttax disposable income (pretax income, minus direct taxes, plus social assistance transfers) reduces the top 10% income share by only a couple of percentage points, while only marginally increasing that of the bottom 50%.

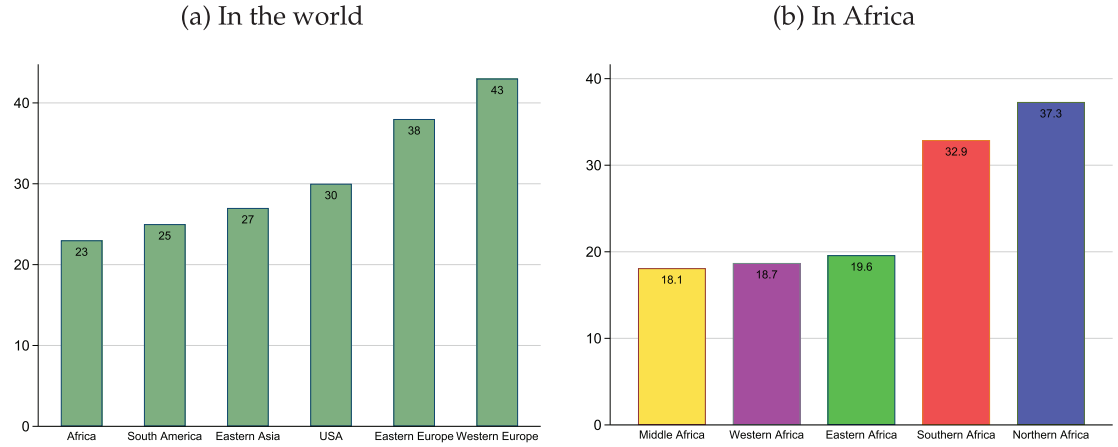


Fig. 12. General Government Revenue in 2019 (% of GDP). *Notes*. Authors' computations using data from the World Economic Outlook (International Monetary Fund). General government revenue consists of taxes, social contributions, grants receivable, and other revenue.

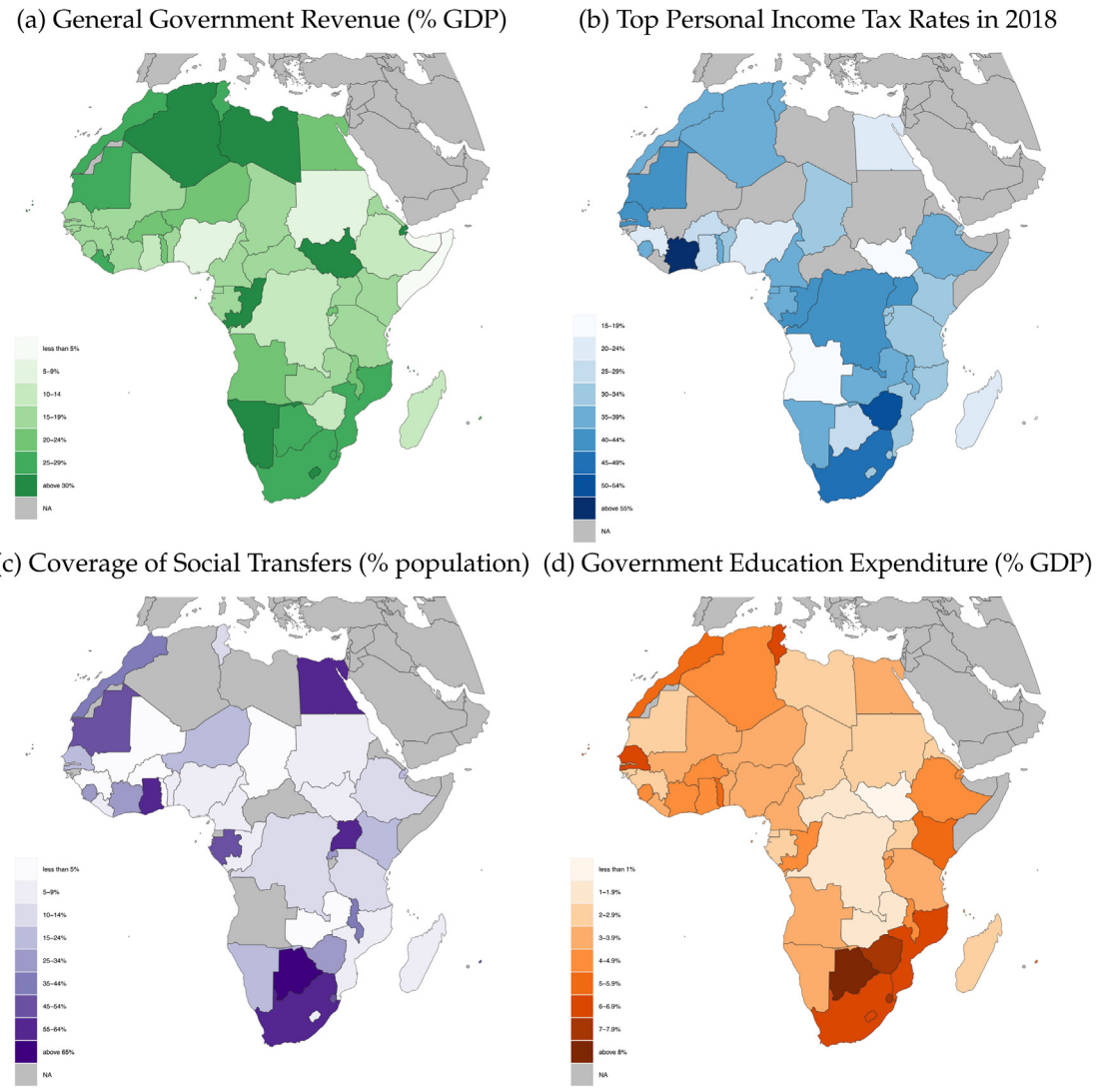


Fig. 13. Characteristics of African Tax-and-Transfer Systems. *Notes*. Authors' computations combining data from the World Economic Outlook (International Monetary Fund), Deloitte (Guide to fiscal information: Key economies in Africa, 2018), the Ernst & Young 2018–19 Worldwide Personal Tax and Immigration Guide, 2019, and the World Development Indicators (World Bank). General government revenue consists of taxes, social contributions, grants receivable, and other revenue. Data is from 2018 for government revenue, from most recent available years for other variables. Coverage of social protection and labor programs (SPL) shows the percentage of population participating in social insurance, social safety net, and unemployment benefits and active labor market programs. Estimates include both direct and indirect beneficiaries. Government expenditure on education (current, capital, and transfers) corresponds to all expenditure by the general government, including expenditure funded by transfers from international sources.

5. Conclusion

Existing data sources on economic inequality in Africa are scarce and raise many challenges. We have tried to respond to one of the main challenges, namely the strong underestimation of inequalities by consumption-based indicators. The resulting estimates, though far from perfect, are at least conceptually comparable with the rest of the world.

The pan-African income distribution built from these estimates appears to be particularly unequal compared to other world regions. Within-country inequality accounts for a large part of pan-African inequality, and indeed many African countries rank among the most unequal in the world. Southern African countries are the most unequal of the continent, while inequality tends to be lower towards the North and the West.

Historical and institutional determinants may account for part of the geographical patterns of African inequality. Settler colonialism seems to cast its long shadow on Southern Africa even after the demise of apartheid, even in countries where white settlers have left for long. In North Africa, postcolonial policies inspired by socialism may have contributed to mitigating this legacy. The egalitarian spirit of Islam is also a potential candidate for explaining the lower levels of inequality observed in Northern and Western Africa.

The evolution of inequality since 1990 is even harder to measure, because data reliability becomes even more questionable as we go back in time. There has been a very modest decrease in inequality in Africa as a whole, which is entirely accounted for by a slight decrease in between-country inequality. Within-country inequality shows no clear trend overall, due to a very wide variety of trajectories that cannot even be summed up in clear regional patterns. Understanding potential drivers of the evolution of inequality over time in Africa remains an open issue.

We stress that further research on the subject requires African countries to cooperate to produce more reliable, transparent, and harmonized distributional data, on pretax and posttax income inequality as well as on wealth distributions. Recent digitization and tax data sharing efforts in certain countries (Côte d'Ivoire,

Senegal, Mali, or South Africa, for instance) are interesting examples that could be expanded to other parts of the continent.

Data availability

The inequality series are available on WID.world. Other data are currently being uploaded to a data repository.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A

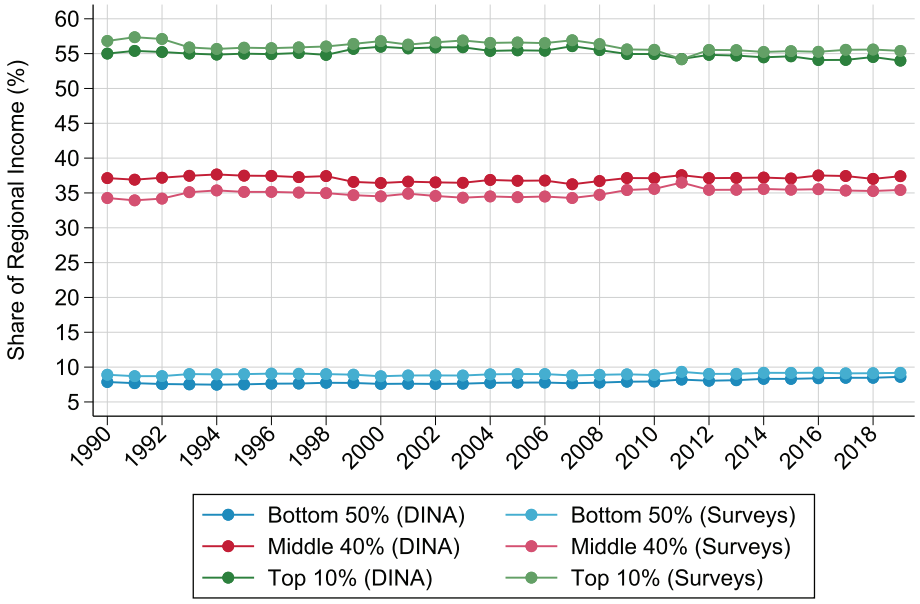

Fig. A.1. Evolution of the Pan-African Income Distribution (Survey-Based versus DINA Estimates). *Notes.* Authors' computations combining survey, tax, and national accounts data. The figure compares DINA estimates, rescaling each distribution to net national income, to survey-based estimates, which rely on survey estimates of average income.

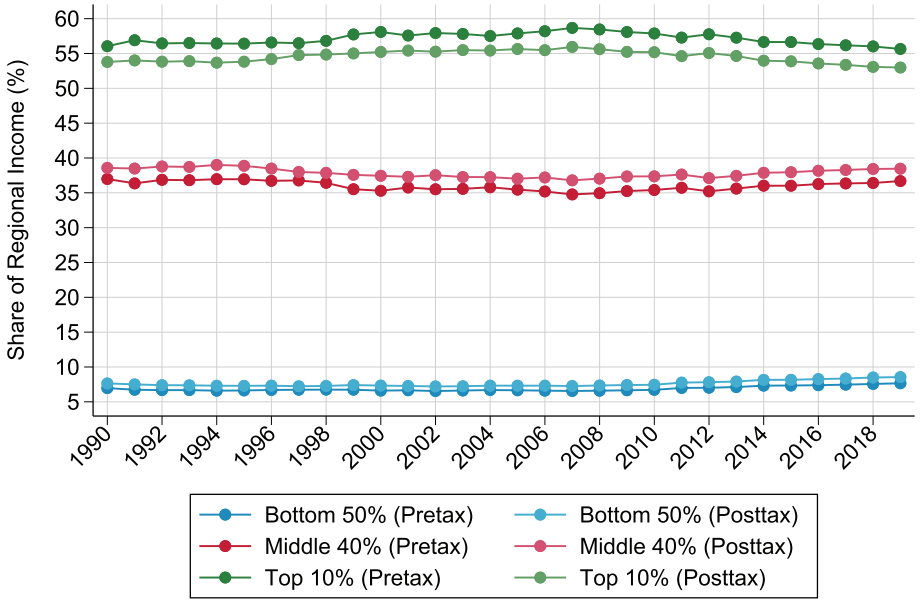

Fig. A.2. Evolution of the Pan-African Income Distribution (Pretax versus Posttax). *Notes.* Authors' computations combining survey, tax, and national accounts data (pretax); preliminary estimates from Gethin (2022) (posttax). The figure compares the evolution of top 10%, middle 40%, and bottom 50% shares in Africa as a whole in terms of pretax income and posttax disposable income (pretax income, minus direct taxes, plus social assistance transfers).

Table A.1
Logistic Fit of Income-Consumption Profiles.

Survey	$\hat{\alpha}$	$\hat{\beta}$	Adj. R^2
African countries			
Cote d'Ivoire, 1998	0.85	0.10	0.96
Cote d'Ivoire, 2002	0.81	0.13	0.99
Cote d'Ivoire, 2008	0.84	0.11	0.96
Cote d'Ivoire, 2015	0.85	0.12	0.99
Ghana, 1988	0.87	0.13	0.99
Ghana, 1998	0.81	0.14	0.96
Guinea, 1994	0.85	0.07	0.74
Madagascar, 1993	0.91	0.06	0.94
Uganda, 1992	0.92	0.04	0.72
Other countries			
India, 2005	0.82	0.14	0.99
India, 2011	0.86	0.14	0.98
Thailand, 2000	0.78	0.16	0.97
Thailand, 2001	0.77	0.16	0.98
Thailand, 2002	0.82	0.14	0.98
Thailand, 2004	0.86	0.11	0.96
Thailand, 2006	0.82	0.13	0.95
Thailand, 2007	0.83	0.13	0.95
Thailand, 2009	0.84	0.12	0.96
Thailand, 2011	0.84	0.12	0.93
Thailand, 2013	0.87	0.11	0.91
Thailand, 2015	0.89	0.10	0.93

Source: authors' computations. *Interpretation*: the best logistic fit for the ratio of consumption to income by percentile in 1998 Cote d'Ivoire yields a functional form of $Q(p) = 0.86 + 0.11 \log \frac{p}{1-p}$, with an adjusted R-squared of 97%.

Table A.2
Top 10% and Bottom 50% Income Shares Before and After Correction, 2019.

Country	Top 10%				Bottom 50%			
	Original Survey	Corrected Survey	Lower Bound	Upper Bound	Original Survey	Corrected Survey	Lower Bound	Upper Bound
Algeria	22.8%	37.3%	33.8%	40.6%	31.3%	20.7%	22.7%	18.9%
Angola	39.6%	57.7%	53.7%	61.2%	17.0%	9.5%	10.8%	8.4%
Benin	37.6%	54.7%	50.9%	58.2%	19.3%	11.5%	12.9%	10.2%
Botswana	41.5%	58.9%	55.1%	62.2%	15.8%	8.7%	9.9%	7.6%
Burkina Faso	29.6%	46.4%	42.5%	50.0%	27.0%	16.5%	18.5%	14.8%
Burundi	31.0%	47.8%	43.9%	51.3%	24.8%	15.1%	16.9%	13.5%
Cabo Verde	32.3%	48.6%	44.9%	52.0%	21.9%	13.3%	14.8%	11.9%
Cameroon	35.0%	51.7%	47.9%	55.1%	19.1%	11.3%	12.7%	10.1%
Central African Republic	46.2%	64.6%	60.8%	68.0%	15.3%	8.0%	9.3%	7.0%
Chad	32.4%	48.9%	45.1%	52.4%	21.3%	13.0%	14.5%	11.6%
Comoros	33.7%	49.9%	46.2%	53.3%	19.8%	12.0%	13.4%	10.7%
Congo	37.9%	55.6%	51.7%	59.1%	18.3%	10.5%	11.9%	9.3%
Cote d'Ivoire	36.1%	53.5%	49.6%	57.0%	20.1%	11.7%	13.2%	10.4%
DR Congo	32.0%	48.4%	44.6%	51.8%	22.1%	13.5%	15.0%	12.1%
Djibouti	32.3%	49.1%	45.3%	52.7%	22.7%	13.8%	15.4%	12.3%
Egypt	26.9%	43.4%	39.5%	47.0%	29.4%	18.5%	20.5%	16.6%
Equatorial Guinea	34.4%	51.2%	47.4%	54.7%	20.4%	12.2%	13.6%	10.8%
Eritrea	28.5%	44.9%	41.0%	48.4%	27.1%	17.0%	18.9%	15.3%
Eswatini	42.7%	59.5%	55.9%	62.8%	15.2%	8.4%	9.6%	7.4%
Ethiopia	28.5%	44.9%	41.0%	48.4%	27.1%	17.0%	18.9%	15.3%
Gabon	27.7%	42.8%	39.3%	46.2%	24.1%	15.4%	17.0%	13.9%
Gambia	28.7%	45.2%	41.4%	48.8%	26.2%	16.2%	18.1%	14.6%
Ghana	32.2%	48.6%	44.8%	52.0%	21.0%	12.8%	14.3%	11.5%
Guinea	26.4%	42.1%	38.4%	45.5%	27.3%	17.4%	19.3%	15.8%
Guinea-Bissau	42.0%	59.7%	55.9%	63.1%	18.4%	10.2%	11.6%	9.0%
Kenya	31.6%	48.2%	44.4%	51.7%	23.1%	14.0%	15.6%	12.5%
Lesotho	32.9%	49.1%	45.4%	52.5%	19.8%	12.0%	13.4%	10.7%
Liberia	27.1%	42.6%	39.0%	46.0%	26.2%	16.6%	18.4%	15.0%
Libya	27.3%	43.4%	39.7%	47.0%	28.1%	17.8%	19.7%	16.0%
Madagascar	33.5%	50.3%	46.4%	53.7%	22.2%	13.3%	15.0%	11.9%
Malawi	36.5%	55.8%	51.5%	59.6%	22.9%	12.8%	14.7%	11.3%
Mali	25.7%	40.6%	37.0%	43.9%	27.5%	17.7%	19.6%	16.1%
Mauritania	24.9%	39.9%	36.3%	43.2%	27.7%	18.0%	19.9%	16.4%
Mauritius	29.9%	46.7%	42.8%	50.3%	26.0%	16.0%	17.8%	14.3%
Morocco	31.9%	48.8%	44.9%	52.4%	24.2%	14.6%	16.4%	13.1%
Mozambique	45.5%	64.2%	60.3%	67.6%	17.0%	8.9%	10.3%	7.7%
Namibia	47.2%	64.0%	60.4%	67.1%	12.8%	6.9%	7.9%	6.0%
Niger	27.0%	42.6%	38.9%	46.0%	26.9%	17.1%	18.9%	15.4%

(*continued on next page*)

Table A.2 (*continued*)

Country	Top 10%				Bottom 50%			
	Original Survey	Corrected Survey	Lower Bound	Upper Bound	Original Survey	Corrected Survey	Lower Bound	Upper Bound
Nigeria	26.7%	42.1%	38.5%	45.5%	26.2%	16.7%	18.4%	15.1%
Rwanda	35.6%	53.4%	49.4%	56.9%	22.1%	12.8%	14.5%	11.3%
Sao Tome and Principe	24.2%	38.7%	35.2%	41.9%	29.0%	19.0%	20.9%	17.3%
Senegal	31.0%	47.2%	43.5%	50.6%	23.3%	14.3%	16.0%	12.9%
Seychelles	33.7%	51.6%	47.5%	55.2%	22.2%	13.0%	14.7%	11.6%
Sierra Leone	29.4%	46.2%	42.4%	49.8%	26.7%	16.4%	18.3%	14.7%
Somalia	27.9%	43.5%	39.9%	47.0%	25.2%	16.0%	17.7%	14.4%
South Africa	50.5%	65.1%	65.1%	65.1%	10.7%	6.3%	5.3%	7.2%
South Sudan	33.2%	49.6%	45.9%	53.1%	20.8%	12.6%	14.0%	11.2%
Sudan	27.8%	44.3%	40.5%	47.9%	27.4%	17.1%	19.0%	15.4%
Tanzania	33.1%	50.7%	46.7%	54.3%	23.9%	14.1%	15.9%	12.5%
Togo	31.6%	47.6%	43.9%	51.0%	21.1%	12.9%	14.4%	11.6%
Tunisia	25.6%	40.7%	37.1%	44.1%	27.8%	17.9%	19.8%	16.2%
Uganda	34.2%	51.5%	47.6%	55.0%	22.3%	13.1%	14.8%	11.7%
Zambia	44.4%	61.5%	57.8%	64.7%	13.4%	7.3%	8.4%	6.4%
Zimbabwe	40.8%	58.5%	54.6%	61.9%	18.0%	10.0%	11.4%	8.7%
Africa	41.0%	54.4%	51.6%	57.0%	13.5%	8.7%	9.5%	7.9%
Eastern Africa	37.9%	53.5%	49.9%	56.7%	18.7%	11.2%	12.6%	10.0%
Middle Africa	48.6%	60.9%	58.1%	63.6%	12.1%	7.6%	8.4%	6.8%
Northern Africa	28.9%	44.5%	40.8%	47.9%	24.4%	15.5%	17.2%	14.0%
Southern Africa	50.4%	65.0%	64.7%	65.3%	10.9%	6.4%	5.6%	7.1%
Subsaharan Africa	42.1%	55.6%	52.9%	58.2%	14.8%	9.3%	10.2%	8.5%
Western Africa	31.4%	46.3%	42.9%	49.6%	20.4%	13.0%	14.4%	11.7%

Table A.3
Data Sources

Country	Distributional data	National accounts data	Method
Angola	HH consumption surveys: 1995, 2000, 2008, 2018	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Burkina Faso	HH consumption surveys: 1994, 1998, 2003, 2009, 2014	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Burundi	HH consumption surveys: 1992, 1998, 2006, 2013	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Benin	HH consumption surveys: 2003, 2011, 2015	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Botswana	HH consumption surveys: 1985, 1993, 2002, 2009, 2015	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
DR Congo	HH consumption surveys: 2004, 2005, 2008, 2012	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Central African Republic	HH consumption surveys: 1992, 2003, 2008	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Congo	HH consumption surveys: 2005, 2011	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Cote d'Ivoire	HH consumption surveys: 1985, 1986, 1987, 1988, 1992, 1993, 1995, 1998, 2002, 2008, 2015; Tax data:2014	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using tax data and national accounts
Cameroon	HH consumption surveys: 1996, 2001, 2007, 2014	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Cabo Verde	HH consumption surveys: 2001, 2007, 2015	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Djibouti	HH consumption surveys: 2002, 2012, 2013, 2017	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Algeria	HH consumption surveys: 1988, 1995, 2011	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Egypt	HH consumption surveys: 1990, 1995, 1999, 2004, 2008, 2010, 2012, 2015, 2017	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Ethiopia	HH consumption surveys: 1981, 1995, 1999, 2004, 2005, 2010, 2015	IMF levels (2019) and World Bank growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Gabon	HH consumption surveys: 2005, 2017	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Ghana	HH consumption surveys: 1987, 1991, 2005, 2012, 2016	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Gambia	HH consumption surveys: 1992, 1998, 2003, 2010, 2015	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts

Table A.3 (*continued*)

Country	Distributional data	National accounts data	Method
Guinea	HH consumption surveys: 1991, 2002, 2003, 2007, 2012	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Guinea-Bissau	HH consumption surveys: 1991, 1993, 2002, 2010	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Kenya	HH consumption surveys: 1992, 1994, 1997, 2005, 2015	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Comoros	HH consumption surveys: 1995, 2004, 2014	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Liberia	HH consumption surveys: 2007, 2014, 2016	World Bank levels (2019) and UN SNA growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Lesotho	HH consumption surveys: 1986, 1993, 1994, 2002, 2010, 2017	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Morocco	HH consumption surveys: 1984, 2000, 2006, 2013	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Madagascar	HH consumption surveys: 1980, 1997, 1999, 2001, 2005, 2010, 2012	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Mali	HH consumption surveys: 1994, 2001, 2006, 2009	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Mauritania	HH consumption surveys: 1987, 1993, 1995, 2000, 2004, 2008, 2014	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Mauritius	HH consumption surveys: 2006, 2012, 2017	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Malawi	HH consumption surveys: 1997, 2004, 2010, 2016	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Mozambique	HH consumption surveys: 1996, 2002, 2007, 2008, 2014	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Namibia	HH consumption surveys: 2003, 2009, 2015	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Niger	HH consumption surveys: 1992, 1994, 2005, 2007, 2011, 2014	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Nigeria	HH consumption surveys: 1985, 1992, 2003, 2009, 2018	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Rwanda	HH consumption surveys: 1984, 2000, 2005, 2010, 2013, 2016	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Seychelles	HH consumption surveys: 1999, 2006	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Sudan	HH consumption surveys: 2009, 2014	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Sierra Leone	HH consumption surveys: 1989, 2003, 2011, 2018	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Senegal	HH consumption surveys: 1991, 1994, 2001, 2005, 2011	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Somalia	HH consumption surveys: 2017	UN SNA levels (2019) and World Bank growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
South Sudan	HH consumption surveys: 2009, 2016	UN SNA levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Sao Tome and Principe	HH consumption surveys: 2000, 2010	World Bank levels (2019) and UN SNA growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Eswatini	HH consumption surveys: 1994, 2000, 2009, 2016	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Chad	HH consumption surveys: 2002, 2003, 2011	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Togo	HH consumption surveys: 2006, 2011, 2015	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Tunisia	HH consumption surveys: 1985, 1990, 1995, 2000, 2005, 2010, 2015	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Tanzania	HH consumption surveys: 1991, 2000, 2007, 2011, 2014, 2017	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Uganda	HH consumption surveys: 1989, 1996, 1999, 2002, 2005, 2009, 2012, 2016	UN SNA levels (2019) and World Bank growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
South Africa	HH consumption surveys: 1993, 1996, 2000, 2005, 2008, 2010, 2014; Tax data:1990–1993, 2002–2012	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using tax data and national accounts
Zambia	HH consumption surveys: 1991, 1993, 1996, 1998, 2002, 2004, 2006, 2010, 2015	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts
Zimbabwe	HH consumption surveys: 1991, 1996, 2011, 2017, 2019	World Bank levels (2019) and growth rates (1950–2021).	Correction of surveys using stylized correction profile (see Section 3.2 and 3.3) and national accounts

Table A.4
Average Incomes: Surveys versus National Accounts.

Country	Year	Survey Mean (2021 PPP USD)	NNI Per Capita (2021 PPP USD)	Ratio of Survey Mean to NNI Per Capita
Angola	2018	2366	6139	0.39
Benin	2018	1839	3146	0.58
Botswana	2015	3835	12248	0.31
Burkina Faso	2018	1854	2011	0.92
Burundi	2013	977	800	1.22
Cabo Verde	2015	3699	5780	0.64
Cameroon	2014	2246	3418	0.66
Central African Republic	2008	1248	1071	1.16
Chad	2018	1441	1669	0.86
Comoros	2014	2822	2942	0.96
Congo	2011	1373	4047	0.34
Cote d'Ivoire	2018	2148	5043	0.43
DR Congo	2012	833	917	0.91
Djibouti	2017	2109	4473	0.47
Egypt	2017	4058	10944	0.37
Eswatini	2016	2122	7709	0.28
Ethiopia	2015	1500	1949	0.77
Gabon	2017	5518	13854	0.40
Gambia	2015	1955	1908	1.02
Ghana	2016	2132	4735	0.45
Guinea	2018	1986	2006	0.99
Guinea-Bissau	2018	1641	1824	0.90
Kenya	2015	1783	3808	0.47
Lesotho	2017	1743	3262	0.53
Liberia	2016	376	1402	0.27
Madagascar	2012	610	1481	0.41
Malawi	2019	863	1458	0.59
Mali	2018	1829	2259	0.81
Mauritania	2014	2313	4560	0.51
Mauritius	2017	6904	25687	0.27
Morocco	2013	4437	7007	0.63
Mozambique	2014	1034	1165	0.89
Namibia	2015	4788	10178	0.47
Niger	2018	1053	1204	0.87
Nigeria	2018	1676	5170	0.32
Rwanda	2016	1155	1903	0.61
Sao Tome and Principe	2010	1657	3449	0.48
Senegal	2018	2310	3050	0.76
Seychelles	2018	10120	25098	0.40
Sierra Leone	2018	1470	1695	0.87
Somalia	2017	1530	1070	1.43
South Africa	2014	5382	13590	0.40
South Sudan	2016	101	675	0.15
Sudan	2014	2744	4605	0.60
Tanzania	2017	1137	2273	0.50
Togo	2018	1826	2088	0.87
Tunisia	2015	5160	9832	0.52
Uganda	2019	1342	2216	0.61
Zambia	2015	1184	3155	0.38
Zimbabwe	2019	2913	3364	0.87

Table A.5
European settlement and Islam correlates versus regional differences. All Africa.

	Top 10% income share			Bottom 50% income share		
	A	B	C	A	B	C
European settlement	+0.052***		+0.063**	−0.020**		−0.025**
	(0.018)		(0.021)	(0.009)		(0.010)
Muslims share	−0.099***		−0.059**	+0.052***		+0.030**
	(0.019)		(0.026)	(0.009)		(0.012)
Northern		−0.099***	−0.091**		+0.056***	+0.048**
		(0.028)	(0.035)		(0.012)	(0.016)
North-Eastern		−0.066**	−0.027		+0.033***	+0.015
		(0.026)	(0.026)		(0.011)	(0.012)
Western		−0.056***	−0.022		+0.025***	+0.009
		(0.018)	(0.020)		(0.008)	(0.009)
Southern		+0.065**	+0.024		−0.035***	−0.018
		(0.026)	(0.026)		(0.011)	(0.011)
Small islands		−0.048	−0.070**		+0.024*	+0.034***
		(0.029)	(0.027)		(0.013)	(0.012)
F-test regional variables (p-value)		0.000	0.081		0.000	0.012
N	54	54	54	54	54	54
Adj. R^2	0.397	0.395	0.518	0.41	0.486	0.587

Source: authors' computations.
Standard errors in parentheses; *: $p < 0.1$; **: $p < 0.05$; ***: $p < 0.01$.
European settlement and Muslims share: see Table 1 and text.
Northern: Algeria, Egypt, Libya, Morocco, Tunisia.
North-Eastern: Djibouti, Eritrea, Ethiopia, Somalia, Sudan, South Sudan.
Western: Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo.
Eastern (omitted): Burundi, Comoros, Kenya, Madagascar, Mauritius, Mozambique, Malawi, Rwanda, Seychelles, Tanzania, Uganda, Zambia.
Southern: Botswana, Eswatini, Lesotho, Namibia, South Africa, Zimbabwe.
Small islands: Islands that were uninhabited before slave trade and colonization: C. Verde, Mauritius, São Tome & P., Seychelles.
F-test for regional variables does not include the small islands dummy.

Table A.6
European settlement and Islam correlates versus geography, precolonial history, and colonizers' identity. All Africa.

	Top 10% income share					Bottom 50% income share				
	A	B	C	D	E	A	B	C	D	E
European settlement	+0.053***	+0.057**	+0.059***	+0.042**	+0.041	−0.020**	−0.023*	−0.023**	−0.016**	−0.016
	(0.017)	(0.026)	(0.019)	(0.017)	(0.028)	(0.008)	(0.012)	(0.009)	(0.008)	(0.012)
Muslims share	−0.112***	−0.116***	−0.106***	−0.113***	−0.111***	+0.058***	+0.062***	+0.054***	+0.63***	+0.064***
	(0.018)	(0.024)	(0.024)	(0.019)	(0.031)	(0.009)	(0.011)	(0.011)	(0.009)	(0.014)
Controls:		p-value	p-value	p-value	p-value	p-value	p-value	p-value	p-value	p-value
Geography		0.724			0.686		0.487			0.615
Slave exports			0.119		0.066			0.096		0.039
Precolonial pol.			0.668		0.722			0.685		0.776
Ethnic fract.			0.268		0.210			0.302		0.253
Colonizer ident.				0.093	0.170				0.035	0.073
N	54	54	54	54	54	54	54	54	54	54
Adj. R^2	0.471	0.444	0.450	0.520	0.483	0.501	0.496	0.483	0.572	0.557

Source: authors' computations.
Standard errors in parentheses; *: $p < 0.1$; **: $p < 0.05$; ***: $p < 0.01$.
European settlement: Dummy for whether European settlers went above 2.5% of total population between 1870 and 1970 (Easterly and Levine, 2016).
Eur. settlement: Algeria, Angola, Eswatini, Libya, Morocco, Mozambique, Mauritius, Namibia, South Africa, Tunisia, Zambia, Zimbabwe.
Muslim share: proportion of Muslims in total population circa 2010.
Muslims > 50%: Algeria, B. Faso, Chad, Comoros, Djib., Egypt, Guinea, G. Bissau, Libya, Morocco, Mali, Mauritania, Niger, Sudan, Senegal, S. Leone, Somalia, Tunisia.
Geography: Abs. latitude, longitude, min month. avg rainfall, max month. afternoon avg humidity, min avg month. low temp, log(coastline/area). (Nunn, 2008).
Slave exports: Log total slave exports normalized by historic population (Nunn, 2008); results are similar with slave exports normalized by land area.
Precolonial polities: Percentages of population from Centralized Stratified, Centr. Egalitarian, and Fragmented Strat.groups; Frag. and Egal. being omitted (Gennaioli and Rainer, 2007). The variables were constructed using the dataset from Michalopoulos and Papaioannou (2013).
Ethnic fractionalization: Alesina et al. (2003). Sao Tome and Principe was set at the value for Cabo Verde.
Colonizer identity: Dummy variables for the last colonizer being either Belgian, British, French, or Portuguese (Somalia has 0.5 for British as it was shared with Italy), and for non-colonized (Ethiopia and Liberia).
In all regressions, a "small island" dummy is included: Cabo Verde, Mauritius, São Tome & P., Seychelles. These islands were uninhabited before slavery and colonization. The precolonial dummies were set at zero (meaning 100% was fragmented and egalitarian); given the small island dummy, this has no impact on reported point estimates.

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