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Bipolarization in ten Sub-Saharan African countries

Florent Bresson*

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Abstract

A new and flexible bipolarization index shows that consumption bipolarization within ten SSA countries is low compared to inequality. Sectoral and regional income disparities drive observed bipolarization; religions and ethnic groups have limited contributions.

JEL codes: D31, D63.

Keywords: Bipolarization, inequality, Sub-Saharan Africa.

What characterizes relative income distributions in Africa? Do they show large inequalities? Do they show distinctive features like excessive skewness or fat tails? How homogeneous are these distributions across the continent? Data limitations do not make it possible to document the relative distribution of income within African economies as precisely as for other continents, but numerous studies have nevertheless tried to analyze them through the lens of inequality (Chancel et al., 2023). Up to now, bipolarization has received little attention, despite the appeal of the concept to investigate issues related to economic dualism or conflicts.¹ Defined as a tendency towards bimodality (Wolfson, 1994), bipolarization is more appropriate than inequality for the study of the existence of a middle class whose role is regarded as crucial for income growth within each country (Easterly, 2001).

To broaden our knowledge about the relative distribution characteristics of Sub-Saharan African economies, I apply a new index on consumption series from perfectly comparable surveys for ten Western and Central Africa.² Our estimates show moderate bipolarization levels that are mainly driven by regional and educational income discrepancies.

1 A new index

Bresson et al. (2023) introduces four families of bipolarization indices. Among the family of relative and rank-dependant indices, an appealing member is the index B^G defined as:

$$B^G(p) = \frac{(1-p)((1-G_t)\mu_t - (1+G_b)\mu_b)}{\eta}, \quad (1)$$

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¹One exception is Nigeria (see Clementi et al., 2017).

²Benin, Burkina Faso, Chad, Cote d’Ivoire, Guinea, Guinea Bissau, Mali, Niger, Senegal, and Togo.

where $p \in]0, 1[$ is a population percentile, μ_Y and G_Y are respectively the average income and the Gini index associated with the income vector Y , subscript b and t respectively refer to the p poorest and $(1 - p)$ richest parts of the population, and $\eta := p(1 + G_b)\mu_b + (1 - p)(1 - G_t)\mu_t$. Whatever the size of the population and the chosen value for p , values of B^G range from 0 (perfect equality) to 1 (perfect bimodality with zero income for the poorest group).

As stressed in Bresson et al. (2023), B^G satisfies a complete set of desirable axioms for a bipolarization index and makes it possible to go beyond the usual comparison between the poorest and richest halves of the population. Moreover, B^G has a meaningful interpretation. Indeed, like the other members of its family, it is based on the existence of a counterfactual perfectly bimodal income distribution that shows the same average income and the same degree of bipolarization as the considered income distribution. In this counterfactual distribution, only two income levels y_b and y_t (with $y_b \leq y_t$) are observed so that everyone within the p bottom part earns y_b while every member of the top $(1 - p)$ part enjoys y_t . With this counterfactual distribution in mind, B^G then corresponds to the excess income share of the top part, that is the difference between its income share $\frac{(1-p)y_t}{\mu}$ and its population share $(1 - p)$, expressed as a fraction of its maximum value, namely p . Another appealing feature is that B^G is additively decomposable into a spread and clustering component. The spread component relates to the difference in averages between the two groups; the clustering component captures the effect of income heterogeneity within each group.

2 Bipolarization in Western and Central Sub-Saharan Africa

All surveys are from the 2018/2019 EHCVM project led by the World Bank and the WAEMU Commission, and aimed at producing harmonized household survey data.³ The estimated consumption aggregates are pretty comprehensive as imputed rents for housing are included in addition to other traditional expenditure and self-consumption items... Finally, consumption levels are spatially deflated to make them perfectly comparable across regions and areas. For the present study, I focus on the traditional choice $p = 0.5$, but also consider the unbalanced partition $p = 0.9$. The individual is the unit of analysis, and I assume no economy of scale in consumption nor differences in needs.

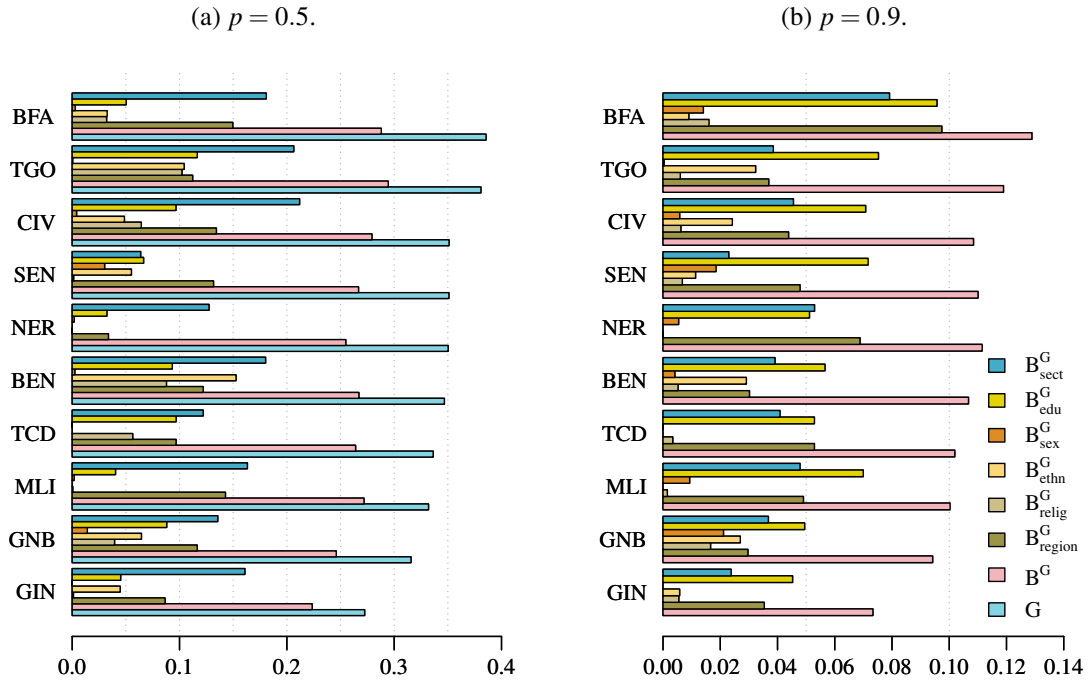
Estimated values for G range within the interval $[0.27, .38]$ (cf. Figure 1a). The corresponding maximum values for B^G are between 0.54 (Guinea) and 0.77 (Burkina Faso).⁴ Estimated values within $[0.22; 0.29]$ for B^G hence indicates moderate levels of bipolarization, stressing the substantial contribution of the clustering effect.⁵ It also confirms that inequality and bipolarization orderings may differ slightly. Guinea is both the least unequal and least bipolarized country, but Burkina Faso is the most unequal, while Togo is the most bipolarized when $p = 0.5$. Visual inspection shows that the rank correlation between G and B^G is not perfect, hence providing a rationale for considering bipolarization alongside inequality.⁶ Surprisingly, the bipolarization ordering is poorly affected by changes in p (cf. Figure 1b). For instance, Guinea remains the least-bipolarized country for all values of $p > 0.16$.

³All datasets can be downloaded from World Bank's microdata catalog website, with the exception of Guinea whose data were kindly shared by Guinea's *Institut National de la Statistique*.

⁴Maximum bipolarization corresponds to perfect bimodality, with income density reflecting the chosen value for p . For a given value of G and $p = 0.5$, the maximum value of B^G is thus obtained for a two-person distribution in which income shares are $\frac{1}{2} - G$ and $\frac{1}{2} + G$.

⁵Estimated values are also low in absolute terms. For instance, estimations for Brazil (not shown here) during the period 1981–2014 yield estimates of B^G between 0.4 and 0.51.

⁶Kendall's τ coefficient is 0.64 (p -value= 0.009).



Note: G is the Gini index; B^G is index (1); subscripts _{region, relig, ethn, sex, edu, and sect} refer to counterfactual distributions where each person is given her group's average consumption level, with groups being respectively defined with respect to regions, religiosity, ethnicity, sex, education level, and sector of activity of the household's head.

Figure 1: Inequality and bipolarization in ten Sub-Saharan African countries, 2018–2019.

I also investigate how household characteristics shape observed bipolarization. For this purpose, I consider in turn regions of living, rurality, religion, ethnicity, gender, education level, and sector of main activity for the household's head. Within-group heterogeneity is wiped out by replacing each person's consumption level by its group average, and the index B^G is computed considering only differences between the different groups. If consumption is distributed identically across groups, then $B^G = 0$. On the contrary, if between-group inequalities are large relative to within-group inequalities, B^G will be large compared to (and possibly larger than) the value obtained for the observed distribution. The presented evidence is only suggestive, and its interpretation can only be speculative. Further investigations would be needed to uncover causality.

Religious and ethnolinguistic fragmentation are often pointed out as factors of political and armed conflicts. Except for Benin, our results provide little support for religious and ethnic groups being drivers of observed bipolarization levels.⁷ This does not mean that these structural variables do not matter for social cohesion, but rather that their effect is not channeled via consumption bipolarization. This result contrasts with regional discrepancies that generate values for B^G that, with the notable exception of Niger, represent 37% to 53% of total bipolarization. Activity and sector of activity prove to explain a large share of observed bipolarization. With the notable exception of Senegal where this percentage is only 24%, estimates for counterfactual values of B^G amount to 46% up to 76% of observed bipolarization. Considering the

⁷Information on ethnicity was not available for Chad, Mali, and Niger.

gender of the household's head results in counterfactual values close to zero. Finally, the role of the education of the household's head is limited when $p = 0.5$, but becomes critical for $p = 0.9$. This is hardly surprising since highly skilled and well-paid jobs represent a very small fraction of the working population.

3 Final Remarks

Because of both under-reporting and sampling issues, poor information regarding top consumption levels can generate substantial underestimation for inequality measures (Chancel et al., 2023). Of course, data quality is also a matter of concern for bipolarization measurement. However, our index is more sensitive to consumption levels around the quantile associated with p and is consequently faintly affected by measurement errors at the tails of the distributions. Simulations regarding a possible omission of the consumption level of the top percentile show limited effects on both the value of B^G and the obtained ordering for our set of Western and Central African countries.

Further research would notably consider how bipolarization changes correlate with inequality changes and whether this potential correlation depends on the chosen threshold p .

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