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Exploring the relative marginal effects of household expenditure components on inequality in Chad using decomposition techniques

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Abstract

Purpose – Improving household consumption and reducing inequality are among the goals of developing countries. Therefore, the objective of this study is to investigate the relative marginal effects of components of household expenditure on total inequality.

Design/methodology/approach – We use the Lerman and Yitzhaki method, which allows us to determine the impact of marginal changes on inequality. The data used are from consumption surveys of 6,695 households in 2003, 9,259 households in 2011 and 7,493 households in 2018.

Findings – We observed that spending inequality widened to 0.410 in 2003, 0.420 in 2011 and 0.411 in 2018. Food expenditure during the three periods accounted for most of the variance in total consumption expenditure. The largest impact of a marginal change in spending components on overall inequality was due to transport, communication, recreation and culture, education and miscellaneous goods and services (positive effect) and alcohol and tobacco and expenditure on housing (negative effect).

Originality/value – This study is the first to decompose Chad's Gini coefficient into its components, taking into account their relative marginal effects on total inequality. Income inequality, calculated by the World Bank from the Survey of Budget Consumption in Sub-Saharan Africa, does not reveal the effects and policies specific to its components. This study could fill this gap in the literature on income inequality.

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Keywords Consumption inequality, Poverty alleviation, Income distribution, Marginal effect, Gini coefficient

Paper type Research paper

1. Introduction

Reducing inequality today is the key to improving the economic and social prospects and mobility of the future and the next generation. According to the World Bank, without a significant reduction in inequality, especially in countries where poverty and inequality are high, the world will not reach its goal of ending extreme poverty. The goal of shared prosperity at the World Bank is to ensure that economic growth in developing countries, which helps lift millions of people out of poverty, is not accompanied by increased inequality. A new World Bank initiative to address inequalities in education aims to halve "learning poverty" by 2030, when 53% of children in low- and middle-income countries are unable to read and understand simple texts (World Bank, 2023). Like other African nations, Chad has experienced excessive inequality for decades. The coefficients of Gini (2023) in the CEMAC (Central African Economic and Monetary Community) are as follows: Cameroon 46.2%, Central African Republic 43.0%, Congo 48.9%, Gabon 38.0% and Chad 37.4% (World Bank, 2024a).

In Chad, the annualized growth rates for household consumption were negative, indicating a decline in well-being for households during the 2018–2022 period. Specifically,

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consumption for Chadian households fell by 3% annually over this period. This downturn included a 4.3% reduction in consumption for households within the bottom 40% of the consumption distribution, and a 2.6% decrease for those in the top 60% of the distribution. The disparity in consumption between poorer and wealthier households has led to a rise in consumption inequality in Chad (World Bank, 2024b).

There are persistent spatial disparities in the distribution of consumption. In 2022, urban areas were home to 25.4% of the population and accounted for 44% of the total consumption. This indicates that the urban population benefits from better conditions compared to the rural population, which represents 75% of the total population and owns only 56% of the total consumption (World Bank, 2024b).

Gender inequalities in Chad are persistent everywhere: in 2021, 14.1% of girls and 24.2% of boys completed lower secondary schools in Chad. Adult literacy is lower among women (18.9%) than among men (35.8%) in 2022, and 25.9% of seats in the national parliament were held by women in 2022 in Chad. In 2022, 22.6% of women and 24.9% of men in Chad accounted for, the female participation rate was 48.6%, and the male participation rate was 72.2% in 2023 (World Bank, 2023). Income inequality increased from 2003–2011 but then decreased. From 2003–2011, while poverty rates declined, the inequality of consumption distribution rose from 39.4% to 42.1%. However, inequality decreased to 35% in 2014 and 33.6% in 2018, with declines particularly pronounced in urban areas. The urban Gini coefficient rose from 37.4% in 2014 to 33.7% in 2018 (World Bank, 2021).

The development of an inequality profile will facilitate the formulation of targeted policies to combat inequality.

The choice of consumption inequalities is very important.

(1) Empirical evidence suggests that over time, consumption is more stable than income.

(2) Smoothing gives a substantial advantage to consumption over income when measuring living standards.

(3) Consumption over even a relatively short period, such as a week or two, can tell us much more about living standards over a year (or longer) than income.

In addition to these conceptual arguments, there is empirical evidence that consumption provides a better measure of well-being than income does (Meyer and Sullivan, 2011, 2012).

Studying consumption inequality provides important information for understanding household well-being and the distribution of expenditures on key indicators of well-being, such as food consumption, housing expenses, health expenditures, and education expenditures. Furthermore, the study explores the impact of marginal adjustments in spending on specific goods on overall spending inequality, which can help disseminate useful information about the impact of various policy measures, such as the introduction of percentage product taxes and subsidies, on consumer purchasing behavior (Garner, 1993; Rani and Furrer, 2016).

Inequality in consumption expenditure either decreased or remained unchanged in the three periods examined. These trends raise several interesting questions: Why does inequality increase in some periods, while inequality stagnates or decreases in others? What is the total contribution of different factors to inequality? What policies are increasing (or decreasing) inequality in Chad?

This study contributes to the literature on inequality. First, we analyze the causes of consumption inequality, focusing on all consumption sources. Second, we examine the tendencies and reasons for inequality throughout the 3 periods and investigate the quantity to which guidelines can contribute to lowering inequality (Rani and Furrer, 2016). Finally, we analyze the marginal impact of different consumption patterns on inequality across Chad and recommend public policies when inequalities increase (or decrease).

This paper is divided into several sections. Section 2 focuses on the literature review. Section 3 presents the data source description and empirical strategies. In Section 4, we present the results and discussion, and in Section 5, we present the conclusion and policy implications.

2. Literature review

Many papers have been published on consumption inequality via a variety of sources of household consumption data and empirical approaches (Ayyash and Sek, 2020; Epo and Baye, 2013; Tripathi *et al.*, 2017).

Regression decomposition techniques are used to investigate the determinants of income inequality via data from the Cameroon Household Expenditure Survey 2007, and per capita expenditures are used as a proxy for income. Inequality in Cameroon is explained by education level, health status, urban location, household size, the proportion of family members employed in the formal sector, and agricultural land ownership (Epo and Baye, 2013).

In addition, Tripathi *et al.* (2017) investigated the drivers of inequality in consumer expenditures in urban and rural India via a regression-based decomposition technique for two different periods (2004–2005 and 2011–2012). He reported that the main driver of inequality in urban areas was higher education levels, whereas the main drivers of inequality in rural areas were household size and land ownership. However, a negative contribution from median income households was associated with inequality in urban areas during the study period.

Another study by Ayyash *et al*. (2020) used regression decomposition methods to examine the contribution of microeconomic factors to income and consumption inequality in Palestine using data from the Palestinian Household Expenditure and Consumption Survey 2017. The results revealed that the most important determinants of income and consumption inequality were region, occupational status, and education level of the household head, whereas gender, land ownership, and age made only minor contributions.

Many of these decomposition methods fail to analyze the decomposition of inequality and its relative marginal effects. Lerman and Yitzhaki's methodology to decompose the Gini coefficients is useful for examining how marginal changes in consumption expenditures for components can affect overall inequality (Giangregorio and Fana, 2024; Lerman and Yitzhaki, 1985).

For the decomposition of income inequality in Ghana, income from self-employment and remittance consistently had a balancing effect on the overall household income distribution. This result suggests that targeting poverty reduction strategies to specific income components is important for ensuring effective income distribution that benefits the poor (Novignon, 2017).

In Botswana, between 2009/10 and 2015/16, expenditures for transport, recreation and culture; restaurants and hotels; household goods and services; and miscellaneous housing, education and health increased the Gini consumption inequality (positive marginal effect coefficient). Spending on food, alcohol, tobacco, clothing, shoes, and communications leads to a lower Gini coefficient for consumer expenditure (negative marginal effect coefficient) (Basole and Basu, 2015; Giangregorio, 2024; Mookodi, 2021; United Nations, 2020).

According to Podder (1993), the Gini elasticity can be calculated for specific consumption. These elasticities are immensely useful in aiding policy discussions about the level of inequality in society.

The importance of the problem can be gauged by the fact that a large part of consumption expenditure comes as a cash benefit received from the government. Moreover, the government can indirectly influence other sources of consumption expenditure using appropriate fiscal or monetary instruments.

3. Data source, description and empirical strategy

3.1 Data

The data used are from the Harmonized Household Living Conditions surveys, an initiative of the West African Economic and Monetary Union Commission (UEMOA). All analyses were carried out by the National Institutes of Statistics of Chad (INSEED).

In Chad, the list of enumeration zones (ZDs) with their identification characteristics is the survey sampling frame.

The enumeration zones are separate, nonempty area units covering the whole Chad. Households in the enumeration areas that are drawn at the first degree form the sampling frame of the second degree of this sampling plan. They form the frame of the first degree of the survey. A sample of counting areas is drawn at the first degree. The second-level statistical units or secondary units are made up of households in the first-level enumeration areas. They define the sampling frame of the second degree of the survey.

These surveys were conducted with three repeated visits of 120 days each (the collection was spread over 12 months). The average size of each ZD is 200 households at each census: first and second Population and Habitat Censuses (RGPH1 in 1993 and RGPH2 in 2009).

The ZDs are drawn with equal probability in each stratum: simple random draws without discounting. In addition, twelve (12) households are selected to draw single at equal probability without a discount in each ZD because these populations often have a close lifestyle.

The areas of study are those parts of the surveyed universe (Chad) for which significant results, i.e. separate estimates with sufficient precision, are sought. These study areas form a division of the national territory and allow analysis at the national level and at the urban and rural levels.

The data collected during these surveys were used to measure the standard of living concern of household consumption, whether it was subject to monetary expenditure (own consumption, donations received, goods purchased, and services allocated) or the expenditure made for ceremonies, gifts, etc. All consumer spending and major purchases were recorded daily or retrospectively over a week, month, past four months, or years. To this end, the questionnaires used to estimate the annual expenditure of households of different modules are as follows: current expenses and daily direct debits entered; current household expenses; nonindividual household expenses; and individual household expenses. Sample of interviewed households: 7,493 in 2018, 9,259 in 2011, and 6,695 in 2003.

3.2 Description of variables

Overall, household expenditures may also be disaggregated into expenditures on different commodities/items. We disintegrated the overall expenditure into 12 expenditure sources/groups of expenditures. The types of consumption expenditures are as follows: food: expenditures on food and nonalcoholic beverages; alcohol and tobacco: expenditures on alcoholic beverages and tobacco; clothing and footwear: clothing and footwear expenses; housing: expense accommodation, water, electricity, gas and other fuel costs; furnishing: expenditures on furniture, household items and routine maintenance; health: expenditures for health and hygiene; transport: the expense of transportation and travel; communication: expenditures for communication and telecommunication; recreation and culture: expenditures for recreation and sports; education: education expense; and hotels and restaurants: expenses for hotels and restaurants and miscellaneous goods and services: expenditures for miscellaneous goods and services.

Table 1 describes their summary statistics.

3.3 Empirical strategy

3.3.1 Theoretical framework. Consumption inequality is a better measure of changes in well-being than income inequality. Economists consider the use of inequality in consumption to be theoretically interesting: theoretical foundations (utility theory). The first papers published in the literature that examined different dimensions of inequality in consumption were those by Cutler *et al*. (1991), Cutler and Katz (1992) and Slesnick (1994). Several papers develop this vision via various data sources from the consumer spending survey and empirical approaches (Aguiar and Bils, 2015; Attanasio *et al*., 2005; Attanasio and Pistaferri, 2014).

In the theoretical framework, we used the Lerman and Yitzhaki methodology for the decomposition of Gini factors of consumer spending in Chad.

Table 1. Descriptive statistics

Variable	Obs	Weight	Mean	Std. Dev	Min	Max
2003						
Total Expenditure	6,695	1258709.62	1,256,954	1,244,464	10650.54	44,700,000
Food	6,695	1258709.62	842304.8	821468.9	900	14,200,000
Alcohol and tobacco	6,695	1258709.62	23174.67	65604.02	0.00	1,276,513
Clothing and footwear	6,695	1258709.62	121976.5	173126.9	0.00	6,237,000
Housing	6,695	1258709.62	47247.04	106254.6	0.00	2,747,000
Furnishing	6,695	1258709.62	70864.35	367111.3	0.00	28,100,000
Health	6,695	1258709.62	15075.22	48491.06	0.00	1,650,000
Transport	6,695	1258709.62	47593.43	197958.2	0.00	20,300,000
Communication	6,695	1258709.62	1436.733	36852.28	0.00	2,920,000
Recreation and culture	6,695	1258709.62	13717.14	76862.53	0.00	3,877,500
Education	6,695	1258709.62	6243.183	24539.3	0.00	1,235,000
Hotels and restaurants	6,695	1258709.62	43483.76	158900.8	0.00	3,047,750
Miscellaneous goods and services	6,695	1258709.62	23836.81	17,0536	0.00	16,900,000
2011						
Total Expenditure	9,259	1784040.19	1,194,121	1,338,430	63,475	32,700,000
Food	9,259	1784040.19	786060.2	1,108,706	1216.667	32,600,000
Alcohol and tobacco	9,259	1784040.19	35681.39	105698.9	0.00	3,066,000
Clothing and footwear	9,259	1784040.19	111235.4	205229.5	0.00	6,356,150
Housing	9,259	1784040.19	64606.35	105788.1	0.00	1,989,000
Furnishing	9,259	1784040.19	63333.22	21577.52	0.00	1,280,350
Health	9,259	1784040.19	37755.31	104069.5	0.00	2,740,000
Transport	9,259	1784040.19	14089.51	86956.28	0.00	3,027,000
Communication	9,259	1784040.19	17450.35	72850.81	0.00	2,688,833
Recreation and culture	9,259	1784040.19	15936.95	79675.68	0.00	4,776,000
Education	9,259	1784040.19	15154.93	57397.22	0.00	2,328,500
Hotels and restaurants	9,259	1784040.19	8704.849	44065.34	0.00	2,433,333
Miscellaneous goods and services	9,259	1784040.19	24112.55	75520.29	0.00	2,433,333
2018						
Total Expenditure	7,493	2931672.3	1,828,316	2,099,555	101774.1	136,000,000
Food	7,493	2931672.3	826019.6	1,377,457	2545.686	134,000,000
Alcohol and tobacco	7,493	2931672.3	21018.7	68265.31	0.00	3,052,652
Clothing and footwear	7,493	2931672.3	108237.6	115770.3	0.00	1,142,016
Housing	7,493	2931672.3	261064.9	291459.1	0.00	5,135,849
Furnishing	7,493	2931672.3	73569.92	106481.2	0.00	1,911,888
Health	7,493	2931672.3	63410.04	123951.7	0.00	1,718,479
Transport	7,493	2931672.3	96907.28	399968.1	0.00	11,000,000
Communication	7,493	2931672.3	73606.3	156270.2	0.00	2,759,113
Recreation and culture	7,493	2931672.3	17461.91	58683.95	0.00	1,273,793
Education	7,493	2931672.3	13451.59	66379.05	0.00	2,089,899
Hotels and restaurants	7,493	2931672.3	219211.6	303961.3	0.00	4,420,532
Miscellaneous goods and services	7,493	2931672.3	54356.97	71164.23	0.00	1,342,280

Source(s): Authors' own work

3.3.2 Model specifications. We suppose a household's consumption expenditure, y, with its lowest level, a, highest level, b, and the cumulative distribution of consumption expenditure F; then, half of the Gini's mean difference (G) can be written as follows.

$$G = \int_a^b F(y)(1 - F(y))dy \tag{1}$$

Using integration by parts, with $u = F(y)(1 - F(y))$ and $v = y$, we obtain

$$G = \int_a^b y\left(F(y) - {}^1\!/\!_2\right)f(y)\,dy \tag{2}$$

By defining $y(F)$ as the inverse function of $F(y)$, Equation (2) can be further transformed to

$$G = 2\int_0^1 y(F)\left(F - {}^1\!/\!_2\right)dF \tag{3}$$

Note that F is uniformly distributed between $[0, 1]$ so that its mean is $1/2$ (Lerman and Yitzhaki, 1985; Novignon, 2017).

Equation (3) can be rewritten as follows.

$$G = \frac{2\,cov\,(y, F)}{\bar{y}}. \tag{4}$$

The Gini coefficient is considered an indicator of inequality in the distribution of consumption expenditure among the population P of n households $(i = 1, \ldots, n)$, y_j $(j = 1, \ldots, m)$ is the j^{th} consumption expenditure in the distribution, y is the total expenditure, and $\sum_{k=1}^{i} y_k$ is the cumulative expenditure up to the i^{th} household and ranges between 0 for $i = 0$ and y for $i = n$ (Basole and Basu, 2015; Giorgi and Gigliarano, 2016). The formula is given as the covariance of the total consumption expenditure (y), the cumulative distribution of F and the mean of y in P: $\bar{y}$

The total consumption expenditure is decomposed such that:

$$\mathrm{y} = \sum_{j=1}^{m} y_j.$$

The components are food, alcohol and tobacco, clothing and footwear, housing, health and hygiene, transport, communication, recreation and culture, education, hotels and restaurants, and miscellaneous goods and services.

F_j represents the cumulative distribution of y_j, and $\bar{y}_j$ is the mean. Therefore, the Gini coefficient of the j^{th} component is calculated as follows:

$$G_j = \frac{2\,cov\,(y_j, F_j)}{\bar{y}_j}. \tag{5}$$

Then, utilizing the cumulative distributions and averages of the fuzzy poverty ratio,

The Gini coefficient of the total expenditures is expressed as follows:

$$G = \sum_{j=1}^{m} 2\frac{cov\,(y_j, F)}{\bar{y}}. \tag{6}$$

Based on Lerman and Yitzhaki (1985), we combine the equations above and then show that the relative Gini coefficient can be decomposed as follows (Basole and Basu, 2015):

$$G = \sum_{j=1}^{m}\left(\frac{cov\,(y_j, F)}{cov\left(y_j, F_j\right)}\ \frac{2\,cov\left(y_j, F_j\right)}{\bar{y}_j}\ \frac{\bar{y}_j}{\bar{y}}\right). \tag{7}$$

with $R_j = \frac{cov\,(y_j,F)}{cov(y_j,F_j)}$; $G_j = \frac{2\,cov(y_j,F_j)}{\overline{y}_j}$ and $S_j = \frac{\overline{y}_j}{\overline{y}}$

$$\text{Thus, } G = \sum_{j=1}^{m} R_j\, G_j S_j = \sum_{j=1}^{m} C_j. \tag{8}$$

where R_j is the correlation between the contribution of attribute y_j and consumption expenditure, G_j is the Gini coefficient for each of the expenditure components and S_j is the contribution to the total consumption expenditure of the j^{th} component (Lerman and Yitzhaki, 1985).

This decomposition allows us to determine the influence of a consumption expenditure source (Arslan and Taylor, 2012; Azam, 2016):

(1) How important is the consumption expenditure source with respect to total income (S_j)?

(2) How equally or unequally distributed is the consumption expenditure source? (C_j)

(3) The consumption expenditure source is correlated with total consumption expenditure (R_j).

Equation (8) indicates that any change in the variables R_j, G_j or S_j will be mirrored by changes in C_j. The higher the value of one of these components is, the more C_j increases, and the more consumption expenditure inequality increases since $G = \sum_{j=1}^{m} C_j$. We can also write $G = \sum_{j=1}^{m} w_j G_j$ (6), where $w_j = S_j R_j$ is the Gini weight of source j, which indicates its importance among other sources and can therefore also allow a more precise description of the reality of inequality. We also write $C_j = w_j G_j$. Similarly, concentration coefficients are often used to measure income-related inequalities in other socially important variables (Demsou, 2023): $Conc_j = G_j R_j$ (9).

We also measure the relative effects of inequality by calculating the relative consumption expenditure inequality:

$$I_j = \frac{C_j}{G} = \frac{R_j G_j S_j}{G}, \tag{10}$$

the relative marginal effects:

$$I_j - S_j = S_j\left(\frac{G_j R_j}{G} - 1\right) \tag{11}$$

and the expenditure elasticity (the part of the concentration coefficient to the overall Gini index):

$$e_j = \frac{G_j R_j}{G}. \tag{12}$$

$I_j - S_j$ shows the ceteris paribus effect of an incremental change in the share of consumption expenditure on the overall concentration, which is expressed as a share of the overall Gini coefficient. It is also known as an elasticity in economic parlance, according to (Lau and Koo, 2017).

The relative marginal effects ($I_j - S_j$) refer to the proportional change in overall inequality because of the additional percentage change in the j^{th} expenditure source. A positive (negative) sign of the marginal effect implies that a small increase in the expenditure of a particular source will increase (decrease) the inequality in the overall expenditure distribution. Since S_j may be positive, the values of $(I_j - S_j)$ may be positive, negative or zero depending upon the values of R_j, G_j and G.

(1) Value of $(I_j - S_j) < 0$ when the Gini correlation coefficient is negative ($R_j < 0$)

(2) Value of $(I_j - S_j) < 0$ when the value of the Gini correlation coefficient is positive ($R_j > 0$) and the Gini index of the expenditure source (j) is lower than the overall Gini index

(3) $I_j - S_j) > 0$ when the value of the Gini correlation coefficient is positive ($R_j > 0$) and the expenditure concentration index is larger than the overall Gini index (Giorgi and Gigliarano, 2016; Ogwang, 2016).

(4) The value of $(I_j - S_j) = 0$ if the concentration index of expenditure sources is equal to the overall Gini coefficient or if the part of the j^{th} component to total consumption expenditure is equal to the relative part of the j^{th} component to the overall Gini index ($S_j = I_j$) (Giangregorio, 2024).

When the relative marginal effect is positive (negative), expenditure on a particular source is an increasing (decreasing) function of overall expenditure, and the nature of the expenditure source is considered progressive (regressive). In other words, the progressive (regressive) nature of expenditure indicates that the source supports richer (poorer) sections of society. A positive relative marginal effect thus indicates the pro-rich nature of the expenditure source, and inequality is increasing. The negative marginal effect of the expenditure source implies a regressive or pro-poor nature of the expenditure source. In such cases, the source of expenditure is decreasing inequality.

We use the sgini command in Stata, which analyses the Gini coefficient by source of consumption and allows us to calculate the impact that a marginal change in a particular source will have on inequality (Lerman and Yitzhaki, 1985).

4. Results and discussion

4.1 Total inequality of consumption expenditure

The analysis was performed using household consumer expenditure data from the National Hemisphere. Survey samples for 2003, 2011, and 2018.

The Gini coefficient also has a geometrical representation, allowing one to see variations in the inequality between alternative distributions as well as the influence of different income or consumption sources.

A Gini coefficient of zero represents perfect equality, while a coefficient of one represents perfect inequality. The higher the value of the index is, the greater the inequality (Sitthiyot and Holasut, 2020). It is used as an indicator of inequality in the distribution of consumption expenditures among the population (Basole and Basu, 2015; Giorgi and Gigliarano, 2016).

Before we analyze the components of the Gini coefficient decomposition of consumption expenditure inequality, it is important to look at overall income and poverty income inequality in Chad between 2003, 2011 and 2018.

The number of poor people increased from 4.7 million in 2011 to approximately 6.5 million in 2019. Social policies for poverty and inequality reduction seem to result in a decline in income and poverty, but they are often not sufficient to significantly modify the structure of income distribution.

Table 2 shows that the overall Gini coefficient for consumption expenditures was 0.410 in 2003, 0.420 in 2011 and 0.411 in 2018.

4.2 Decomposition of overall inequality by source of consumer spending

Consumer expenditure inequality at the source level is also examined by discerning total expenditure sources as major groups/consumption sources (Sen and Das, 2018).

Table 2. Inequality by source

Source	2003	2011	2018
Food	0.416	0.458	0.412
Alcohol and tobacco	0.848	0.860	0.872
Clothing and footwear	0.580	0.630	0.510
Housing	0.780	0.692	0.414
Furnishing	0.823	0.126	0.519
Health	0.814	0.807	0.744
Transport	0.882	0.937	0.883
Communication	0.993	0.916	0.744
Recreation and culture	0.908	0.916	0.860
Education	0.850	0.856	0.902
Hotels and restaurants	0.897	0.932	0.615
Miscellaneous goods and services	0.870	0.793	0.544
Chad	*0.410*	*0.420*	*0.411*

Source(s): Authors' own work

Table 2 decomposes overall inequality by source of consumer spending and the overall Gini coefficient over the three periods.

The lowest inequality is observed consistently in the case of food in 2003 and 2018, but in 2011, it is observed in the case of furnishing.

Expenditures on education, health, transport, communication, alcohol and tobacco consumption, recreation and culture, hotels and restaurants, and miscellaneous goods and services show greater inequality than expenditures from other sources (Pirttilä and Suoniemi, 2010, 2014). The highest inequality is exhibited in the expenditures on communication in 2003, transport in 2011, and education in 2018; these expenditures constitute the basis of food spending. Inequality has declined in the case of health, communication and miscellaneous goods and services and has risen in the case of education (Lino, 2017).

4.3 Main sources of consumer spending influencing inequality

By decomposing the overall Gini coefficient by expenditure source, we can estimate the extent to which a particular expenditure source drives overall expenditure inequality (Ayyash and Sek, 2020; Giangregorio, 2024).

Such a global analysis also aims to identify the main sources of consumer spending influencing inequalities in household consumption spending and their evolution over time.

Figure 1 shows the main sources of consumer spending influencing inequality in Chad over the analyzed period.

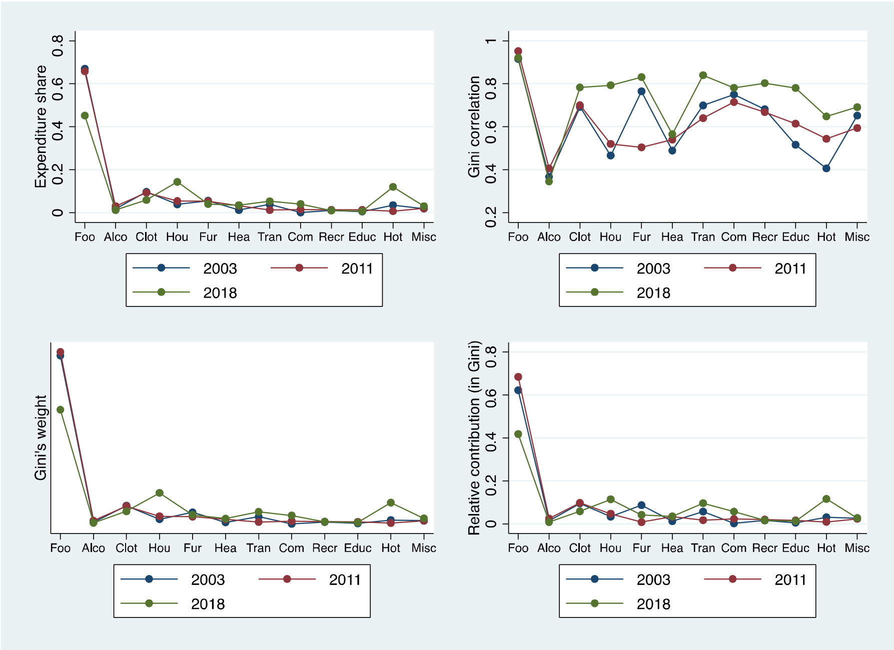
The greatest increase in the relative contribution of expenditure sources to overall inequality is observed for food consumers during the three periods (Giangregorio, 2024).

Expenditures on food, clothing, and footwear, furnishing, and transport contributed more than 5% of the overall inequality in 2003.

Two expenditure sources (food, clothing and footwear) made up more than 5% of the overall inequality in 2011 (Piekut and Piekut, 2022). Expenditures on food, clothing and footwear; transport; communication; and hotels and restaurants contributed more than 5% to the overall consumption inequality in Chad in 2018 (Piekut and Piekut, 2022). During the three periods, the expenditure sources (food, clothing and footwear) contributed more than 5% to the overall inequality.

The variability in the influence of this source of consumer spending is mainly due to variations in the relative contribution, the Gini correlation term, the share of consumer spending and the weight of the Gini coefficient.

The Gini coefficient between source j and total consumption expenditure is measured by *Rj*. Like for the Pearson correlation coefficient, for i) 1, source j is an increasing function of total



Note(s): Foo = food; Alco = alcohol and tobacco; Clot = clothing and footwear; Hou = housing. Fur = Furnishing; Hea = Health; Tran = Transport; Com = Communication; Recr = Recreation and Culture; Educ = Education; Hot = Hotels and Restaurants; and Misc = Miscellaneous Goods and Services
Source(s): Authors' own work

Figure 1. Contribution of expenditure sources to overall inequality

consumption expenditure; for ii) −1, source j is a decreasing function of total consumption expenditure; and for iii) 0, the source of consumption expenditure j is equally distributed, and its contribution to total inequality is zero.

The large consumption expenditure shares of total inequality potentially have a large impact on inequality. The consumption expenditure components of poverty have a potentially large impact on inequality (Yitzhaki and Schechtman, 2013).

Weighting a source in total inequality indicates its importance among other sources and can therefore also allow a more precise description of the reality of inequality.

The source of consumer spending, for which its share, Gini correlation, Gini weight, and relative contribution are significant, contributes to the increase in inequalities over the three periods (Bação *et al.*, 2024; Giangregorio, 2024).

4.4 Marginal effects of expenditure sources on overall inequality

Using factor source decomposition allows us to estimate the elasticity of expenditure inequality to changes in expenditure sources (Giangregorio, 2024).

Overall consumption inequality is undoubtedly influenced by the distribution patterns of various spending components. Podder (1993) noted that when considering whether a source of consumption expenditure has equal or inequitable effects, the marginal effect is more informative than the proportional contribution to inequality. Paul (2004) and Kimhi (2007) determined that marginal effects would be more consistent in such an analysis. The marginal effect also shows the impact of a 1% change in a particular source of consumption expenditure on overall consumption inequality. Negative (positive) marginal effects suggest that a percentage increase in a particular source of consumption expenditure reduces (increases) overall consumption expenditure inequality and thus has an equalizing effect.

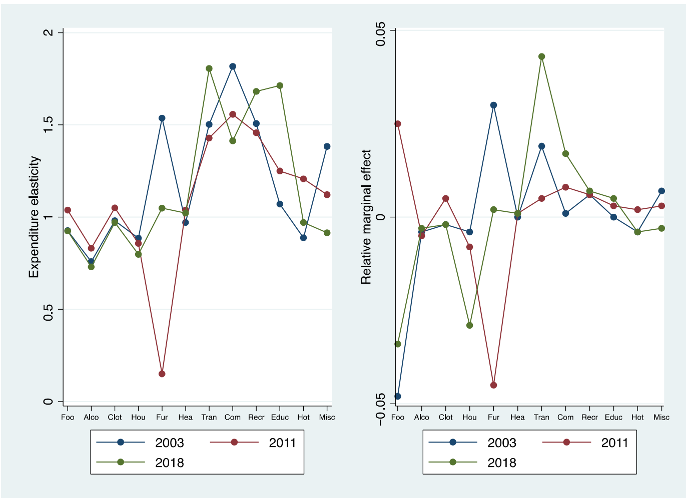
Figure 2 shows the marginal effects of expenditure sources on overall inequality in the Chad of consumption expenditure sources analyzed.

Some sources were characterized by a concentration coefficient with a value lower than the overall concentration coefficient (Giangregorio, 2024). This means that these consumption expenditure sources had a reducing effect on overall consumption expenditure inequality in Chad.

Among the three factors, alcohol and tobacco consumption and expenditure on housing have a reducing effect on total inequalities. The other sources whose concentration coefficient is higher than the Gini coefficient are transport, communication, recreation and culture, education and miscellaneous goods and services. These factors had an amplifying effect on global inequalities during the three periods. The relative marginal effects of different spending sources are estimated to assess whether spending sources increase or decrease inequality.

During the three periods, expenditure components such as transport, communication and recreation and culture expenses reveal inequality, with increasing effects on overall inequality and conversely for expenditure components such as expenditure on alcohol and tobacco and expenditure on housing.

In 2003, expenditures on food, alcohol and tobacco, alcohol and tobacco, housing, and hotels and restaurants appeared to reduce inequality, while other expenditures had inequality-enhancing effects. Notably, the impact of a marginal change in food expenditures has the greatest effect on reducing inequality. Furnishing expenditures show a maximum inequality-enhancing effect.



Note(s): Foo = food; Alco = alcohol and tobacco; Clot = clothing and footwear; Hou = housing. Fur = Furnishing; Hea = Health; Tran = Transport; Com = Communication; Recr = Recreation and Culture; Educ = Education; Hot = Hotels and Restaurants; and Misc = Miscellaneous Goods and Services
Source(s): Authors' own work

Figure 2. Marginal effect

In 2011, expenditures on alcohol and tobacco, furnishings and housing had inequality-reducing effects, and other expenditures had inequality-enhancing effects. It should be noted that the impact of a marginal change in food expenditures has the maximum inequality-enhancing effect (Lino, 2017; United Nations, 2020). Furnishing expenditures have the greatest effect on reducing inequality.

In 2018, expenditures on food, alcohol and tobacco, housing, hotels and restaurants, hotels and restaurants, and miscellaneous goods and services appeared to reduce inequality, while other expenditures had inequality-enhancing effects (Lino, 2017). Food expenditure has the maximum inequality-reducing effect. Transport expenditure has the maximum inequality-enhancing effect.

4.5 Limitations of results

Consumption inequality is not only an outcome of economic forces such as economic growth, but also a consequence of public choices. It is often a choice of inadequate investment in education, health and social protection for the vulnerable and marginalized. Fiscal policies affect consumption inequality directly, through the quality of public expenditure. Conversely, the failure to reduce inequality undermines macroeconomic stability, economic growth and causes inter-communal conflict. Tackling consumption inequality could influence not only public attitudes, but also long-term socio-economic stability and development in Chad. Reducing consumption inequality and increasing private consumption would require policies to ensure a consistent income for the low-income population. The results of this study also suggest that the government should provide strategic support for low-income people’s spending on basic necessities and try to stabilize prices. Tackling consumer inequality could lead to policies that support the spending of low-income groups on services such as health care. Finally, to address the consumption inequalities between income groups and regions, policy efforts should be made to strengthen public education and improve related institutions through educational reform, as well as reduce the regional gap in the provision of education services.

The limitations of these results would also largely due to survey data that do not provide accurate information on consumer spending. Some limitations due to data collection methodology could be recognized. First, consumption relative to expenditures is overestimated for those who made long-term purchases in the current period and underestimated for those who made long-term purchases in the past. Most personal consumption surveys do not include information on the stock of durable consumer goods owned by a household. Second, some consumption is received in kind through friends, relatives, private institutions (charities or churches), or government transfers (in the form of in-kind benefits or vouchers, such as food stamps, school lunches, medical care through Medicaid or Medicare, rent subsidies, etc.). Third, some consumption is conducted at home using time and goods, such as child care provided by parents or siblings. Fourth, some components of consumer spending (durable goods and housing rents) are difficult to measure. Fifth, nonresponse to surveys and measurement errors can lead to other problems. Finally, converting expenditures to consumption requires knowledge of the prices paid for the goods consumed. Usually, this requirement is met by assuming that all households face the same prices.

Limitations of the results could also result from the use of cross-sectional rather than longitudinal data.

5. Conclusions and policy implications

This research investigated the relative marginal effects of components of household expenditure on total inequality by decomposing them into inequality in household expenditure sources and the degree of consumer expenditure inequality in Chad.

The dataset presented in this paper is important for understanding the extent of consumer spending inequality in Chad in 2003, 2011 and 2018. Chad's Gini index plummeted to 0.375 in 2018 (worldBank.org), while Chad's Gini index for consumer spending fell to 0.411 in 2018. Our findings confirm this reduction. Household income inequality, often calculated from consumer budget surveys in sub-Saharan Africa, makes it difficult to determine the effects and policies specific to its components. These surveys do not provide exhaustive data on the different components of household income (Atadouanla Segning *et al*., 2023; Caracciolo and Santeramo, 2013). Overall, the Gini decomposition results obtained in this empirical study are consistent with the structure of inequality in other developed countries. For example, in less developed countries, food spending often explains most of the variance in total consumption expenditure (Grigg, 1994). The effects of inequality affect not only the poorest minorities but also the poorest minorities. If disparities in consumer spending become more pronounced, the population also suffers more from social competition and a lack of self-confidence (Bapuji, 2015; Jindra, 2014). Of these three factors, alcohol and tobacco consumption and expenditure on housing have a reducing effect on total inequalities (negative effects). The other sources whose concentration coefficient (expenditure elasticity) is higher than the Gini coefficient are transport, communication, recreation and culture, education and miscellaneous goods and services (positive effects).

This study recommends that governments focus on different sources of spending and their ability to increase or reduce overall inequality and take appropriate measures to achieve the objectives of reducing distributive inequalities and improving household well-being.

Since education and health have positive effects in all three periods, they deserve special attention from policy makers:

(1) The government must provide free education in poor areas and implement employment programs to eliminate gender inequality in education spending.

(2) Access to health centers must be improved through the construction of new health centers in rural areas, and effective strategies to improve access to health care across the country must be proposed.

Policymakers, on the other hand, should face potential challenges in the implementation of these policies. Among others, four constraints are particularly relevant, such as political resistance, economic constraints or cultural factors: (i) a lack of economic diversification; (ii) the low productivity of the rural sector; (iii) exposure to shocks; and (iv) low levels of human capital. Insecurity and insufficient public investment are the drivers of these four factors, and lasting progress in reducing inequality will require complete stabilization of the security situation. Consolidation of the rule of law and investment in physical and institutional infrastructure are necessary to support long-term productivity growth.

Finally, further research is needed to address income and consumption inequalities and regional differences in the distribution of household final consumption expenditures across components. And longitudinal studies or comparative analyses with other countries facing similar problems would be most beneficial and future research.

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Appendix

Table A1. Inequality effects by source

Variable	S_j	G_j	R_j	G_j* R_j	C_j	$I_j = C_j/G$	I_j-S_j
2003							
Food	0.670	0.416	0.915	0.380	0.255	0.622	−0.048
Alcohol and tobacco	0.018	0.848	0.367	0.311	0.006	0.014	−0.004
Clothing and footwear	0.097	0.580	0.692	0.402	0.039	0.095	−0.002
Housing	0.038	0.780	0.466	0.363	0.014	0.033	−0.004
Furnishing	0.056	0.823	0.765	0.630	0.036	0.087	0.030
Health	0.012	0.814	0.489	0.398	0.005	0.012	0.000
Transport	0.038	0.882	0.699	0.616	0.023	0.057	0.019
Communication	0.001	0.993	0.750	0.745	0.001	0.002	0.001
Recreation and culture	0.011	0.908	0.681	0.618	0.007	0.016	0.006
Education	0.005	0.850	0.516	0.439	0.002	0.005	0.000
Hotels and restaurants	0.035	0.897	0.406	0.364	0.013	0.031	−0.004
Miscellaneous goods and services	0.019	0.870	0.652	0.567	0.011	0.026	0.007
Total	1.000	0.410	1.000	0.410	0.410	1.000	0.000
2011							
Food	0.658	0.458	0.952	0.436	0.287	0.684	0.025
Alcohol and tobacco	0.030	0.860	0.406	0.349	0.010	0.025	−0.005
Clothing and footwear	0.093	0.630	0.700	0.441	0.041	0.098	0.005
Housing	0.054	0.692	0.520	0.360	0.020	0.047	−0.008
Furnishing	0.053	0.126	0.504	0.063	0.003	0.008	−0.045
Health	0.032	0.807	0.540	0.436	0.014	0.033	0.001
Transport	0.012	0.937	0.640	0.600	0.007	0.017	0.005
Communication	0.015	0.916	0.715	0.654	0.010	0.023	0.008
Recreation and culture	0.013	0.916	0.668	0.612	0.008	0.020	0.006
Education	0.013	0.856	0.614	0.525	0.007	0.016	0.003
Hotels and restaurants	0.007	0.932	0.544	0.507	0.004	0.009	0.002
Miscellaneous goods and services	0.020	0.793	0.594	0.471	0.010	0.023	0.003
Total	1.000	0.420	1.000	0.420	0.420	1.000	0.000
2018							
Food	0.452	0.412	0.921	0.380	0.172	0.418	−0.034
Alcohol and tobacco	0.012	0.872	0.345	0.300	0.004	0.008	−0.003
Clothing and footwear	0.059	0.510	0.783	0.399	0.024	0.058	−0.002
Housing	0.143	0.414	0.793	0.328	0.047	0.114	−0.029
Furnishing	0.040	0.519	0.831	0.431	0.017	0.042	0.002
Health	0.035	0.744	0.565	0.420	0.015	0.035	0.001
Transport	0.053	0.883	0.840	0.742	0.039	0.096	0.043
Communication	0.040	0.744	0.781	0.581	0.023	0.057	0.017
Recreation and culture	0.010	0.860	0.803	0.691	0.007	0.016	0.007
Education	0.007	0.902	0.780	0.704	0.005	0.013	0.005
Hotels and restaurants	0.120	0.615	0.648	0.399	0.048	0.116	−0.004
Miscellaneous goods and services	0.030	0.544	0.691	0.376	0.011	0.027	−0.003
Total	1.000	0.411	1.000	0.411	0.411	1.000	0.000

Source(s): Authors' own work

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